I/O News

CS-400 Benchmark

User Notes

New Product Announcements

THE OFFICIAL PUBLICATION OF THE INTERNATIONAL ASSOCIATION OF CROMEMCO USERS

Volume Four, Number Six

Single Copy Price $10.00

Users Report Big Speed Improvements with MAXIMIZER

When Cromemco introduced the Maximizer co-processor for its Cromix systems, it was clear that it would provide a big boost in system speed. Just how fast the Maximizer can make your system go has become apparent as we have received the first reports from our users, many of whom are reporting system speed improvements of from five to ten times, or faster.

The Maximizer is a two-board set that can plug into any Cromemco system. The Maximizer contains a very fast processor which can be assigned tasks by the main processor of the system, and actually operate in parallel with the main processor. The processor in the Maximizer is a type 2901C processor, with a companion 74S557 multiplier, that operates at a fast 48MHz clock rate.

The tasks that the Maximizer can perform are determined by the microcode program that is resident in the Maximizer. This microcode is contained in 24K bytes of high-speed RAM (organized as 4096 48-bit words) which make up what is called the "writeable control store." Because the microcode resides in Maximizer-resident RAM memory, different microcode can be loaded into the Maximizer by the system to define the different tasks that the Maximizer can perform.

EASY TO USE

Probably the best thing about the Maximizer is that it is so easy to use. This comes about because Cromemco provides special *fast versions* of its Basic, C, Pascal, and Fortran languages that automatically load the required microcode into the Maximizer, and automatically assign numerical tasks to the Maximizer during program execution. These four "fast" languages are source-code compatible with Cromemco's standard D-series languages, so it is easy to make existing programs take advantage of the Maximizer by simply re-compiling them (or in the case of Basic, reinterpreting them) with one of the fast languages.

HOW FAST IS FAST?

One way to measure the speed of a computer's numeric calculations is by means of the Whetstone benchmark test suite. Cromemco D-series Fortran '77 running on an X-series or XC-series Cromemco system can execute the entire suite of Whetstone test 54,000 times per second. Fast Fortran, using the Maximizer, can execute this test suite 306,000 times per second for nearly a six-times improvement in speed.

Looking at specific tests within the

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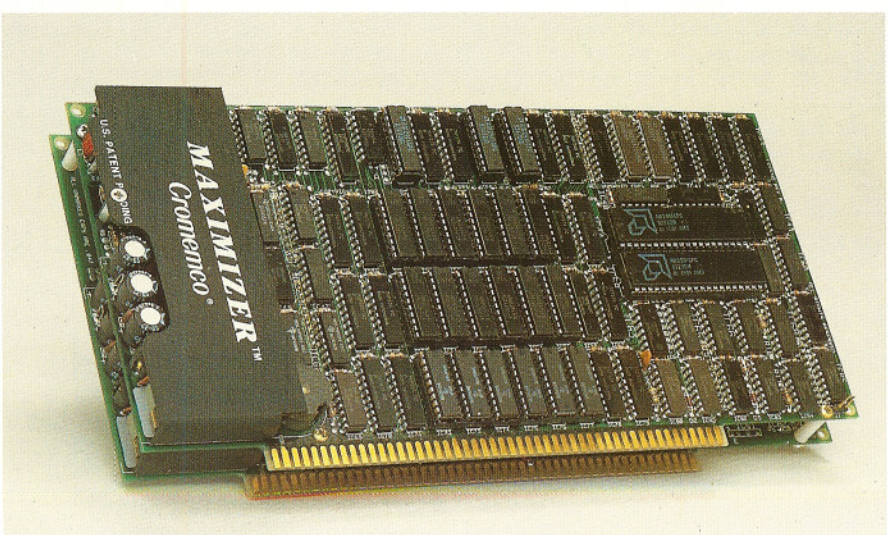

The HP Laserjet

by Robert Brown

In the May 1985 issue of *Byte* magazine, Jerry Pournell wrote an article entitled "The Search for the Perfect Product." His selection was the Hewlett-Packard Laserjet printer.

Purchasing the Laserjet Printer can be a tough decision because of the $3,495 price tag. There are scores of other printers that can be purchased for substantially less.

As with any purchase, you should consider the benefits that the HP Laserjet would provide. Some of the most important are:

► Quiet. The most noise that you hear is the paper falling onto the paper tray.

► Fast. The literature says about 8 pages a minute. This figure depends on how you compute a page, but the printer is much faster than most common printers.

► No special paper. Uses regular 8-½ by 11 or 8-½ by 14 inch paper (as well

Continued on page 11

New 32K Structured BASIC

by Charley Dobson

Systems Atlanta, Inc. announces the availability of four new versions of Cromemco Structured Basic. Each version retains all the excellent qualities of the original, but adds significant improvements in performance and many new features. In order of increasing significance are new versions for the following operating systems: CDOS, CP/M, Cromix and MS or PC-DOS.

All versions include greater speed, formatted input, a high speed built-in sort, and several other new features. On hard disk systems, program loading is up to five times faster than in earlier versions. Other file I/O is up to two and a half times faster. The built in sort will sort three thousand random long (8 byte) floating point numbers in seven seconds. Sorting of only several hundred items is too fast to measure.

Formatted input in the new versions simplifies one of the most difficult programming tasks and makes bomb-proof

Continued on page 18

ANNOUNCING!!

Powerful New Software Packages Including

RealWorld ™

on UNIX System V

RealWorld™

Software Standards announces their new line of RealWorld accounting packages for operation under Cromemco's new UNIX System V machines. These packages are written in powerful High-Performance Micro-Focus cobol and utilize their new super high-speed NATIVE-CODE GENERATOR. All packages are optimized for speed and support the full multi-user record level locking features of UNIX System V.

FEATURES:	PACKAGES INCLUDE:
Multi-User	General Ledger
Fully Integrated	Accounts Payable
Advanced Mini-Computer Design	Accounts Receivable
Password Protection	Payroll
Extensive Data File Integrity Check	Inventory Control
Backup/Restore Facilities	Order Entry / Billing
Native-Code Program Files	Sales Analysis

Software Standards also supports the RealWorld packages in full multi-user under 68000 Cromix as well as in single-user under Z80 Cromix

dB COMPILER

dBcompiler from WordTech Systems is a powerful dBase II compiler. Compiled dBase II application programs operate without the presence of dBase II. The compiler gives the programmer the ability to generate machine-efficient, stand alone, effectively 'encrypted' programs. Generally, applications will execute faster when compiled, and require less space. In addition, dBcompiler offers an amazing speed increase in both sort and indexing operations.

VE VT100 & VT52 emulators

Software Standards VT100 and VT52 terminal emulators give your Cromemco systems the power to communicate with large DEC minicomputers. Available for 68000 & Z80 CROMIX as well as the C-10.

Contact your Cromemco dealer for more information. If you don't have a Cromemco Dealer, contact Software Standards for the name of the dealer nearest you.

Software Standards, Inc.

6191 Choctaw • Baton Rouge, La. 70805

504/355-8024

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SPECIALS OF THE MONTH

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September/October, 1985 Volume Four, Number Six

I/O News

The Official Publication of The International Association of Cromemco Users is available through membership in the association. Editorial and advertising policies are designed for the enlightenment of the members in regard to new uses for, and developments of, Cromemco products and other products compatible with Cromemco systems.

COVER FEATURES

ARTICLES & FEATURES

DEPARTMENTS

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Return postage must be included with all manuscripts and photos submitted if they are to be returned. The IACU and I/O News accept no responsibility for the return of unsolicited materials.

William E. Jaenicke
Editor and Publisher

Lisa B. Jaenicke
Business Manager

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input...

One of the aspects of Cromemco computers not often discussed is that of speed of various configurations. I enclose a sheet on the relative speeds of a crude benchmark that I have done on a few hard disk drives. You may not be too familiar with the Rodime drive, being British (yes, we do make hard disk drives!), but some of your readers might like to add to the list.

On the subject of speed, I might give a little information on 68000 memory speeds. The MCU/MSU combination is slower than the 256KZ because of the time it takes to do error checking. When ECC is on it is even slower. The old versions of INIT did not compensate for this speed variation and give a rough indication of speeds. This test was done with exactly the same hardware changing only the memory boards.

Boards	ECC	Reported Drive RPM	Relative Speed
256KZ	—	299	100%
MCU/512MSU	OFF	332	90%
MCU/512MSU	ON	347	86%

These boards were the earliest ones and they may be faster nowadays.

I trust that your readers find this information interesting.

M V J Arnold
General Manager
HALLAM COMPUTER SYSTEMS LTD.
Five, Onslow Road, Sheffield S11 7AE
England

Some Speed Comparisons For Various Hard Disks As Available On Cromemco Cromix Computers

These speed tests are crude and cannot be taken as absolute. There are factors such as alternate tracks and disk layout to take into account. However, all the tests were done on a newly created disk with only the Cromix operating system (plus /usr directory). The tests were done under Cromix 20.63 without any other tasks running.

There were four basic tests performed. They all involved using copy without the -v option (which slows it down), and in the case of the STDC read-after-write verification was enabled.

These tests were:

1. Copy a 100K file in the same directory.
2. Copy a 1000K file in the same directory.
3. Copy a 100K file across the disk (usually from 800K into the disk to about 1Mb from the end of the disk).
4. Copy a 1000K file across the disk (usually from 800K into the disk to about 1Mb from the end of the disk).

On tests 3 and 4 there is further to seek on a 20Mb drive that a 5Mb drive. I leave you to do your own calculations.

Drive & Interface	Approx Capacity	100K In Directory	1000K In Directory	100K Across Disk	1000K Across Disk
IMI 7710 & WDI-II	10Mb	0:16	2:56	0:21	3:22
IMI 5007 & WDI-II	5Mb	0:17	3:13	0:32	4:25
IMI 5021 & WDI-II	18Mb	0:19	3:33	1:12	11:05
Kennedy 53160 & SMDI	140Mb	0:16	2:34	0:22	3:21
IMI 5018 & STDC	17Mb	0:08	1:18	0:13	1:38
Rodime R0204 & STDC	24Mb	0:11	1:31	0:15	2:01
Rodime R0204E & STDC	49Mb	0:09	1:26	0:13	1:52

Notes:

1. Times are minutes:seconds.
2. An IMI 5018 is the IMI 5021 with the ST506 conversion.
3. Under Cromix 30.51 the R0204E & STDC perform some 8% faster — other combinations have not been tested.
4. The 100K and 1000K above are decimal (100,000 and 1,000,000 bytes respectively).

MVJ Arnold. January 1985
Revised March, April 1985
Hallam Computer Systems Ltd. Sheffield. England.

Editor:

I enclose a programming solution to the "Seven/Eleven" problem submitted by Phil Schneider in *I/O News, Vol. IV, No. 4.*

Incidentally, I have been using PL/I on a Cromemco System III for over four years now, under either CDOS or Micah CP/M. This language is certainly software's best kept secret! It is clear, English-like, extensive, structured, with a friendly compiler and linker, and very fast (see *BYTE* benchmarks, Sept. 1983).

Your magazine has had some interesting articles and I have been reading it with great interest from the first issue. More programming articles will be appreciated.

George Inglessis
P.O. Box 2310
Vineland, NJ 08360

In addition to Mr. Ingessis' solution, Tom Beer — our C-10 Column editor — submitted a Basic program which arrived at the correct answers, though using a different approach. As Tom put it, the program is more an exercise in numerology and creativity than it is an efficient benchmark. If anyone is interested, we can provide you with the Basic program solution (never did receive Jepsan's solution).

Ed.

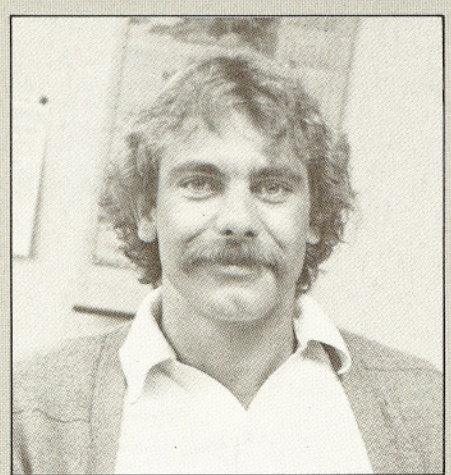
```
seven11: proc options (main);
        /*****************************************************
                TO FIND FOUR NUMBERS (WITH TWO DECIMALS)
                   WHOSE SUM AND PRODUCT EQUALS 7.11
                     George Inglessis, 20 April 1985
                111 N. Lincoln Ave., Wenonah, NJ  08090
        *****************************************************
                Rationale: Since 7.11 = 3 x 3 x 0.79, one
                number must be 0.79 or a multiple. If these
                are subtracted from 7.11 the remainders then
                are: 6.32, 5.53, 4.74, 3.95, 3.16, etc. The
                only final digit that will give even products
                is 5. Therefore one number is 4x0.79=3.16, while
                the sum of the other three is 3.95 the product
                is 2.25. The rest is trial and error...
        *****************************************************
                Written in PL/I-80, on Cromemco S-3 with CP/M
                        Running time: 14 seconds
        *****************************************************/
        declare
                (a, b, c, d) decimal (3,2),
        print file;

        open file (print) output stream title ('$lst');

        a = 3.16;
        do b = 1.00 to 3.95 by 0.05;
                do c = b to 3.95 by 0.05 while ((b + c)<3.95);
                        d = 3.95 - b - c;
                        put skip edit (a,b,c,d) (f(4,2),x(2));
                        if a*b*c*d = 7.11 then do;
                                put file (print) skip edit
                                (a,b,c,d) (f(4,2),x(2));
                                put file (print) skip;
                                stop;
                                end;
                end;
        end;
end seven11;
```

```
3.16  1.20  1.25  1.50
```

output...



Bill Jaenicke

Lisa Jaenicke

Hellos and Goodbyes

Change is in the nature of things. Nothing escapes it. Recently, The I.A.C.U. and *I/O News* underwent a change of its own. Richard Kaye, Editor and Publisher of *I/O News* for these past five years, has moved on to explore other career opportunities. We wish him the best, and will miss him. But most of all we appreciate the work he did in making The I.A.C.U. and *I/O News* beneficial to Cromemco users. It will not be easy to fill his shoes.

Likewise, Lynn Platzek, Production Manager of *I/O News*, has taken a new job with *Road & Track* magazine where she is expanding her own skills and experience. Stepping into her place is Lisa Jaenicke (my wife), with a new title of Business Manager, which encompasses both the magazine production aspects and those of administration of the Association. Lisa's administrative and organizational skills, as well as her optimistic view of the future, have already been a great help in the day-to-day operation of The I.A.C.U.

With the change in personell came a change in office location. The I.A.C.U. and I/O News are now located at:

34021 Granada, Suite B
Dana Point, CA 92629
(714) 661-9764

The P.O. Box in Irvine is still being maintained (we're just a short way south) and all correspondence should be sent to it.

In assuming the role of Editor and Publisher, I had the opportunity to review all the materials collected and received over the past five years. A lot of it found its way into the pages of *I/O News*. Some didn't. But a picture emerged — no, a scenario — which portrayed the rapid evolution of Cromemco systems.

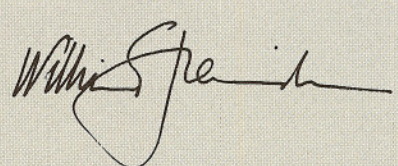
The Z-80 has stepped aside to be replaced by the 68000. Yesterday, 64K of RAM was a lot; today's systems can make use of up to 16 Megabytes. Floppy disk drives have been relegated to purposes of file transfer — the real work and storage being accomplished by the fast and powerful hard disks. We have seen CDOS reach its limits, and have watched Cromix grow from a good idea to one of the most powerful operating systems available. And now there is UNIX. From Z-80 to 68000, 16K RAM to 16 Megabytes, floppy to hard disk, CDOS to Cromix — and now UNIX. And all in such a short time span. It's staggering.

Throughout this evolution, users of Cromemco systems have been in a unique position in relation to other microcomputer users. They've been able to change with the times by upgrading their systems with the new technology as it became available. This has, in turn, put *I/O News* in an equally unique position — all of these systems, and innumerable hybrid combinations, are being employed by our members — and so *I/O News* has had to maintain its coverage across the spectrum. And the spectrum of systems continues to grow. *I/O News* will continue to grow with it.

In this issue, we explore Cromemco's powerful number-cruncher, the Maximizer. And what the Maximizer does to computational capability, the new laser printing technology does to printing. Included in our cover story on the HP-Laserjet are the necessary patches to enable WriteMaster's special features to function. In our New Products section some very exciting products are showcased — new Cromemco graphics boards, a unique Z80 Slave processor, and new Fourth Generation Languages for UNIX, to name a few. And of course our regular columns are present with hints and tips to make your computing tasks all the more effective.

We hope you like the issue. And as always, we are open to any criticism or suggestion you have to make. The only way to keep the information fresh and alive is for you, our readers, to make an effort to let us know what is happening in your field. What software does the best job for you (and equally important, what doesn't)? What new piece of hardware has made a difference, and what did it take to get it working? Again, we would like to know so that we can pass the information along. Please keep the communication lines open.

Before closing this installment of OUTPUT, I wish to extend, on behalf of The International Association of Cromemco Users, our condolences to those of our members in Mexico that suffered as a result of the devasting earthquake which they recently endured. Our best wishes go out to you, along with our hopes for a speedy recovery.



William E. Jaenicke
Editor & Publisher

Current Versions of Cromemco Software

This table lists the current versions of all Cromemco software. It was derived from Cromemco's Software Product Version Report of June 10, 1985. The following notations are used: "NA" implies that the information is not applicable or was not supplied in the product version report. An "*" after the model or release number indicates a preliminary release. Models which have a "-D" indicate 68000 software; those with a "-X" indicate UNIX software. Almost all software is supplied on both 8 inch and 5 inch diskettes, so the "L" (for large) and "S" (for small) have been omitted from the model numbers. Also, almost all software is supplied on Double Sided, Double Density diskettes. Much of the UNIX software is supplied on tape archive.

MODEL	PACKAGE	RELEASE	VERSION	CREATED
3270BSC-D	IBM 3274/51C BSC EMULATOR	1	03.05	02/21/85
ANI-D	ANIMATOR (COBOL-D DEBUGGER)	1	NA	10/24/83
ANI-X	ANIMATOR (COBOL-X DEBUGGER)	1	NA	04/25/85
ASM-D	68000 MACRO ASSEMBLER (CROMIX)	2	01.14	02/16/83
BAS-D	68000 BASIC	1	02.10	11/07/83
BAS-X	UNIX 68000 BASIC	1	02.20	09/27/84
BNET-X	UNIX NETWORKING S/W	1	NA	04/29/85
C10CPM	C-10 CP/M OPERATING SYSTEM	1	02.00	01/17/84
CAMR	CALCMASTER	4	NA	02/29/84
CCC	CROMEMCO 'C' COMPILER	2	05.10	01/04/83
CCC-D	68000 'C' COMPILER	3	02.15	05/17/84
CCC-X	UNIX 'C' COMPILER	1	02.20	09/17/84
CDS	CROMEMCO DIAGNOSTIC SOFTWARE	4	NA	07/15/83
CISAM-D	C-ISAM	2	2.03	12/19/84
CISAM-X	C-ISAM FOR UNIX	1	2.03	10/15/84
COB-D	68000 COBOL COMPILER	2	NA	11/04/83
COBRT-D	RUN TIME COBOL	1	NA	05/02/85
COBRT-X	UNIX RUN TIME COBOL	1	NA	05/21/85
COB-X	UNIX COBOL COMPILER	2	NA	11/04/83
COLL	CROMEMCO OVERLAY LINKER	3	02.04	03/25/83
CRO-D	68000 CROMIX OPERATING SYSTEM	8	20.65	03/27/85
CROMIX	Z-80 CROMIX OPERATING SYSTEM	11	11.27	07/03/84
CRO-PLUS	CROMIX PLUS FOR XC SERIES	2	30.79	04/18/85
CSPD	C-10 SUPER PACK	6	NA	07/25/84
CTDS-S	68000 TAPE DRIVER SOFTWARE	2	NA	11/14/84
CXDR	CROMIX DRIVER PACKAGE	1	NA	05/18/83
DIMR	DISKMASTER	2	01.11	09/08/84
DOS	CDOS OPERATING SYSTEM	12	02.58	11/07/83
FDA	Z-80 MACRO RELOCATING ASSEMBLER	12	03.10	07/18/83
FDB	Z-80 BASIC	11	05.70	03/29/83
FDC	Z-80 COBOL COMPILER	6	04.64	03/29/83
FDF	Z-80 FORTRAN COMPILER	11	03.42	03/30/83
FDR	Z-80 FORTRAN WITH RATFOR	4	01.05	03/29/83
FM2-D	FORMS-2 (COBOL-D FORM GENERATOR)	1	NA	10/24/83
FM2-X	FORMS-2 (COBOL-X FORM GENERATOR)	1	NA	04/25/85
FOMR	FONTMASTER	5	01.16	08/19/83
FOR-D	68000 FORTRAN COMPILER	6	02.15	05/17/83
FOR-X	UNIX FORTRAN COMPILER	1	02.20	09/17/84
FSTBAS-D	68000 FAST BASIC	1	02.10	03/23/84
FSTCCC-D	68000 FAST 'C' COMPILER	2	02.15	07/05/84
FSTFOR-D	68000 FAST FORTRAN COMPILER	3	02.15	10/16/84
FSTPAS-D	68000 FAST PASCAL COMPILER	3	02.15	10/16/84
IDS	IOP DEVELOPMENT SOFTWARE	6	03.00	07/25/83
INFX-D	INFORMIX (68000 RELATIONAL DBMS)	2	03.20	11/19/84
INFX-X	INFORMIX FOR UNIX SYSTEMS	1	03.20	09/19/84
KSAM	KSAM FILE ACCESS SYSTEM (CROMIX)	3	01.04	03/01/83
LEX	UNIX WORDPROCESSING PACKAGE	1	NA	10/10/84
LSP	LISP	5	01.08	03/31/83
MAXASM-D	MAXIMIZER MICROCODE ASSEMBLER	1	02.08	11/06/84
NET	C-NET NETWORK SOFTWARE	2	NA	03/20/84
PAS-D	68000 PASCAL COMPILER	5	02.15	05/17/84
PAS-X	UNIX PASCAL COMPILER	1	02.20	09/17/84
RBTE	REMOTE BATCH TERMINAL EMULATOR	5	01.08	11/17/83
RMCOB-X	UNIX COBOL COMPILER	1	NA	10/31/84
RPG	Z-80 RPG II COMPILER	4	03.02	03/31/83
SDDDEMO	SDD DEMONSTRATION SOFTWARE	1	NA	01/26/84
SDIDEMO	SDI DEMONSTRATION SOFTWARE	5	NA	04/04/83
SGS	SDI GRAPHICS SOFTWARE	6	02.00	09/06/83
SLMR	SLIDEMASTER GRAPHICS EDITOR	4	02.03	04/26/83
SMCBAS-X	UNIX STRUCTURED BASIC	1	NA	11/06/84
SMDS	SMD DRIVE CONTROLLER SOFTWARE	2	NA	07/06/84
SPICE-D	SPICE CIRCUIT DESIGN SOFTWARE	1	11.02	06/21/84
SPMR	SPELLMASTER SPELL PROOFING	5	01.20	06/27/83
STB	32K STRUCTURED BASIC	11	03.65	03/31/83
STB-D	68000 STRUCTURED BASIC	1	1.00	09/24/84
STMR	STATMASTER STATISTICAL PROGRAMS	2	01.04	07/21/83
TDS	TAPE DRIVE SOFTWARE	4	11.11	04/01/83
TEMR	TELEMASTER COMMUNICATION SOFTWARE	2	02.06	04/24/84
TSDI	TRI-SDI GRAPHICS SOFTWARE	3	NA	04/01/83
UDST-X	UNIX DOCUMENTATION SOFTWARE TOOLS	2	NA	02/07/85
UFY-X	UNIFY (UNIX RELATIONAL DBMS)	1	NA	11/01/84
ULTCALC-X	ULTRACALC SPREADSHEET (UNIX)	1	NA	12/15/84
UNIX-X	UNIX OPERATING SYSTEM	2.1	NA	04/15/85
UPST-X	UNIX PROGRAMMERS SOFTWARE TOOLS	2	NA	02/06/85
WPS	WORD PROCESSING SYSTEM	11	06.00	04/01/83
WRMR	WRITEMASTER WORDPROCESSING SYSTEM	10	02.02	11/01/84

New Product Announcements

NEW CROMEMCO GRAPHICS BOARD

Cromemco has announced a new Video Memory Controller board, the SDMB, for the S-Series of graphics products. This board, which can replace and is upwardly compatible with the SDMA board, allows a 65,536-fold improvement in the color capabilities of the S-Series graphics system. The function of the board is to provide the memory control for the interface between the SVID Video Generator Board and the 256KTP Memory Board.

The SDMB offers two new features. The first is a 24-bit/pixel operating mode, in which over 16 million colors can be generated. At any point in time, the number of colors that can be displayed is limited only by the pixel resolution of the television standard — 365,904 displayable pixels for the NTSC standard (756 x 484) — out of the full palette of 16 million colors.

The second added feature is a "micro" scroll, which allows more precise image positioning when scrolling a "zoomed" picture. The SDMB also provides for overlaying images on top of the 24-bit picture: a "32-bit" system can be assembled from a 24-bit background with 8-bit overlay when two SDMB boards and associated memory are used.

Other than the color option, micro-scroll, and overlay capabilities, the SDMB board is functionally equivalent to the SDMA board. It uses a control bit in the software code to select either 8-bit per pixel or 24-bit per pixel modes.

The SDMB is available now, with a list price of $1,295.

CROMIX-PLUS DRIVER SOFTWARE

Cromemco announced the availability of the CXDR driver source code software for the Cromix-Plus operating system. With CXDR, the advanced user can write I/O drivers for raw, block, and character devices. To assist the development of user-written drivers, Cromix-Plus provides a well-defined driver to operating system interface, a complete library of support functions, high-level language header files, and a simplified procedure for generating a new operating system.

In order to use the CXDR software, the user must have version 30.79 of the Cromix-Plus operating system. In addition, the following versions of supporting software are required (included on the CXDR diskette):

68000 Assembler (Asm.bin)Ver. 01.14
C Compiler (C.bin) Ver. 02.41
Code Generator (Code.bin)Ver. 02.41
Library Manager (Maklib.bin)Ver. 00.03
System Debugger (Debug.068)
Psect definition (Psect.068)

CXDR also includes an on-line manual and the C language source files for all of the standard Cromix-Plus drivers.

Subscribers to CXDR updates under Cromemco's Software Update Service will receive the CXDR software in the next release of the CXDR SUDS. The new software, Model CXDR, can be ordered immediately, with delivery in 60 days. The U.S. list price is $95.

TODAY

Another third-party software package is available for Cromemco UNIX-based systems. TODAY™, from bbj Computer Services, Inc., is a Fourth-Generation Language (4GL) providing a complete application development environment. TODAY includes a host of features designed to make software development simpler, faster, and less costly; ongoing software maintenance is facilitated and documentation is provided automatically.

Any commercial business system, no matter how simple or how complex, can be developed entirely in TODAY without the use of conventional languages. Such systems can include Menus, On-line Transactions, Reports, Background Jobs, On-line Help Information, Error Messages, Application Documentation, and a complete Database Definition.

TODAY offers a fully self-contained environment operating under UNIX. Normally, as a TODAY Administrator, Developer, or End User, the only UNIX command deeded is simply "login." UNIX access is readily available if required.

Screens and reports can be created automatically though high-level generators, or "painted" for "you-get-what-you-see" screens and reports.

TODAY uses predominantly non-procedural methods to carry out application development, but where procedural code is required, there is an English-style command set which is easily understood. Commands are structured into small logic blocks called PROCESSES and FUNCTIONS which can link together and tie into specific menus, screen fields, report lines, or decision tables.

TODAY's re-entrant exerciser code maximizes hardware capabilities to achieve fast execution in a multi-user/developer environment. All application definitions are encoded and stored in data files, referred to as P-code files. These direct the TODAY exerciser to execute the defined application, which is the ONLY program needed in the computer memory. Data definitions are held in either global or private data dictionaries. If a change is made to the length of a data dictionary item, this change is automatically reflected in all areas of the TODAY application.

Other features include:

- Foreign language support
- Automatic documentation
- Training mode
- Security

Benefits include:

- Reduced development time and costs
- Reduced training costs
- Simplified maintenance and special versions
- Portability to any other type of computer system running TODAY

TODAY comes with an embedded version of C-ISAM™ and, according to bbj Computer Services Inc., will soon link to INFORMIX™ and UNIFY™.

Though not directly available from Cromemco, TODAY can be ordered directly from bbj Computer Services Inc. The published list price for a developer license is $3000; Run-time licenses begin at $500. Discounts are available to dealers and VAR's.

To order, or for more information, contact:

bbj Computer Services Inc.
2946 Scott Blvd.
Santa Clara, CA, 95054
Telephone: (408) 727-4464
Telex: 510-101-2118

Z-80 SLAVE PROCESSOR

Systems Atlanta has introduced a powerful Z80H slave processor and supporting software for Cromemco Cromix systems. After more than a year of development, this new product offers users of Z80 software all of the speed they ever wished for while keeping all the of the sophistication and special features of their favorite operating system.

Each slave consists of a single S100 card with a fast 8 MHz, Z80H processor, 128K of RAM, and two serial ports and high speed bus interface. Each card can support up to two users whose terminals are connected directly to the serial ports. At the same time, the card may also serve as a general purpose high-speed serial I/O card. Users connected to the card can run applications either in the slave or in the system's memory using the main processor (ex. DPU). Practically all Z80 programs which can be run in system memory can also be run in the slave.

Imagine running an application, such as word processing, with an 8MHz processor at baud rates up to 38K baud (if your CRT will keep up)! Users are cautioned not to use the highest baud rates unless their program is running in the slave. The slaves demand for data can be so fast that the operating system will virtually lock out all other users while trying to satisfy it. The slave can take data from the bus in 256 byte blocks at one megabyte per second. With system overhead it takes about one second for a 32K program to load. Normal console I/O for programs running in the slave does not go through the operating system and thus can be much faster than normal Cromix I/O.

A software license agreement must be signed prior to delivery. The license fee must be paid for each slave. The cost of a single slave with software license is $1095.00. Availability is from stock to thirty days. Direct orders and inquiries to:

Systems Atlanta, Inc.
P.O. Box 99
Lebanon, GA 30146
(404) 928-0240

PHILON FAST/Compilers

Business Communications Systems, Inc. has entered into an OEM agreement with PHILON to provide the PHILON FAST/Compilers for the Cromemco UNIX System V product line.

The PHILON compilers are designed around the Motorola MC68000 family of microprocessors. Included among the compiler's features and benefits are:

- Speed of execution — PHILON FAST/Compilers offer benchmark execution speeds of up to 45 times faster than competition.
- Ease of development — New application systems can be developed quickly and inexpensively by using main-frame quality development features such as full instruction sets and the PHILON interactive debugger — the PHI-Analyser.
- Powerful Advanced Capabilities— PHILON FAST/Compilers are specifically designed for use in developing large-scale applications. PHILON FAST/Cobol, for example, has no artificial limits on program size. In addition, PHILON FAST/Compiler languages can be linked to modules written in any other PHILON FAST/Compiler language.

Price Schedule:

Retail suggested list prices:

Full compiler		Run-Time	Available
Fast/Cobol	$2,200	$330	NOW
Fast/BASIC-C	600	90	NOW
Fast/BASIC-M	600	90	NOW
Fast/C	950	142	NOW
Fast/RPG	1,400	210	2Q85
Fast/Pascal	1,400	210	1Q85
Fast/Fortran	1,200	180	2Q85

Dealer discounts are available. Manuals are available for evaluation purposes prior to purchase, or individually for $50.

At present, the compilers are not ported for operation under Cromix. If enough interest is shown, the ports could be done. Direct orders, or requests for further information to:

Business Communications Systems
510 McClanahan Street, S.W.
P.O. Box 12721
Roanoke, Virginia 24028
Telephone (703)344-5563

ProPrint for C-10 Users

ProtoMatrix Software Development announced the release of ProPrint, a full featured printer driver for the Cromemco C-10 computer (release 1-4 and 5-6). ProPrint provides the printer support you've needed to use WriteMaster™ to its fullest extent.

ProPrint changes the codes that come from WriteMaster (and many other programs) into codes that will operate the special features on your printer.

ProPrint supports boldface, underline, superscript and subscript printing on printers capable of these functions.

ProPrint also provides a command line interface to your printer. From the CDOS prompt, you can advance your paper to the next page, change type styles, character size, spacing, and many other functions — dependent on your printer capabilities.

ProPrint is automatic and easy to use, so easy, you just call it when you boot your computer. It will stay resident until you power off.

ProPrint works with any printer that uses 1-4 character sequences (called control codes) to perform the required functions. It comes with a special program that makes it easy to configure for your particular printer.

ProPrint also comes with three preconfigured drivers for Epson printers, Okidata microline printers, and Diablo and most daisy wheel printers.

ProPrint is available in two formats, C-10 release 1-4 (Part No. PPC5) and for upgraded C-10's (release 5-6, Part No. PPC52).

Pure and simple, if you have an intelligent printer and use WriteMaster, ProPrint can provide you with powerful features and offer elegant solutions to your printer needs.

ProtoMatrix Software Development
12564 Connemara Way
Sunnyvale, CA 94087
(408) 749-1292
Telex: 503898(PROTOMATRIX)

cLINE/cENGLISH

cLINE/cENGLISH, a fourth generation programming language from C LINE, Inc., is now available on the Cromemco System 100 and 400 under UNIX System V.

cLINE/cENGLISH offers exceptional portability and flexibility to the professional applications programmer. The language uses English-like commands to generate C source programs. The C programs use any of several popular database management systems (such as C-ISAM from Relational Database Systems, Inc. and UNIFY from Unify Corp.) to organize and retrieve information. cLINE/cENGLISH is portable to a wide range of microcomputers and minicomputers.

The syntax of cLINE/cENGLISH is similar to that of Ashton-Tate's microcomputer database manager, dBASE III. Features of the language include complete structured control flow, business-oriented data types, multidimensional arrays, full parameter passing, and "include" files. In, addition, actual C code can be embedded in cLINE/cENGLISH programs. The language is complemented by two nonprocedural utilities: cBASE, and interactive tool which allows the creation and maintenance of database file structures, and cSCREEN, a screen generator.

cLINE/cENGLISH is available for UNIX and MS-DOS systems. Applications created under one operating system can be ported to the other.

cLINE/cENGLISH is available directly from C LINE, Inc. for $1695. To order, or for more information, contact:

C LINE, Inc.
Portsmouth Parade
Portsmouth, NH 03801
(603) 431-2111

NEW HARD DISKS FOR CS-100/300

Cromemco has announced some new additions to the CS-100 and CS-300line of supermicros. These new models employ the 140 megabyte Winchester hard disk drive which up to now had been present only in the CS-400, where it gained a reputation for speed and price-performance. The new models, labeled CS100H150 and CS300H150 (both in X and XC versions) are available now. Contact your Cromemco dealer for pricing.

MAXIMIZER

Continued from front cover

Whetstone test suite reveals that the Maximizer can provide even more than six-times speed improvements for some types of operations. In fact the biggest speed improvements are achieved in evaluating trigonometric and other transcendental functions. For example, the Whetstone test for standard Fortran function execution speed is as follows:

```
      X = 0.75
      DO 11 i = 1,n11
      X = SQRT(EXP(ALOG(X)/T1))
11    CONTINUE
```

With standard D-series Fortran an XPU-based machine will execute 93,000 of these loops in 408 seconds. With Fast Fortran and the Maximizer, the same number of iterations takes just 24 seconds. This works out to a remarkable 17-fold improvement in speed.

MICROCODE ASSEMBLER TOO

The Cromemco fast languages come with a standard library of microcode for floating-point operations which is automatically loaded into the Maximizer's RAM prior to program execution. For many users this standard microcode library is all the microcode that they will ever need. However, even more capability can be unleashed from the Maximizer by using customized microcode that is tailored for the specific application. To help you write customized microcode, Cromemco offers a microcode assembler for the Maximizer.

The Maximizer Microcode Assembler was written for Cromemco by Bob Fleming and Cherie Cushner of Futheuristics, an engineering consulting firm specializing in microcode products. By using the microcode assembler you can microcode anything from a matrix operation, to a Fourier transform, to a graphics primitive. A single program call to the Maximizer will execute the entire operation.

One of the first users to take advantage of customized microcode for the Maximizer was Dr. Richard Daly of Colorgraphics Systems in Madison, Wisconsin. Colorgraphics has developed extensive graphics software for the Cromemco S-series graphics hardware, and has made extensive use of the Maximizer.

Dr. Daly describes Cromemco's microcode assembler as "excellent." In order to simulate the effect of an airbrush in the graphics system, Dr. Daly had to rapidly calculate and plot 400 pixels (each pixel corresponding to a droplet of paint that a real airbrush would spray). Each pixel required six 8-bit multiplies and four 16-bit adds to compute. These operations were coded in microcode, using the microcode assembler. According to Dr. Daly the resultant execution speed was five to ten times faster than optimized 68000 assembly code, but even more important, the Maximizer made the difference in being able to truly simulate an airbrush effect.

A 50-TIMES SPEED IMPROVEMENT

Another Cromemco user, Mr. Mike Tiemann, used the microcode assembler to write customized microcode for the Maximizer to execute the Eratosthenes Sieve benchmark. This benchmark program involves the iterative execution of an algorithm that was originally developed to find prime numbers. Mike wrote versions of this benchmark program in C, 68000 assembler, and microcode assembler for the Maximizer in order to compare relative execution speeds. The results are shown in the accompanying table. When written in C, the program calculated 100 prime numbers in 26 seconds. Written in 68000 assembler the corresponding time was 10 seconds. Using the Maximizer, 100 iterations were executed in just .5 seconds. This is an amazing 50-fold increase in speed when compared to the program written in C.

FAST TRANSFER RATES

One reason that the Maximizer is so fast is, of course, because of its high-speed, 48MHz processor. Another reason, though, is that the data transfer to and from the Maximizer is carried out not through the main processor, but rather by direct-memory access (DMA). This means that data (or microcode) is transferred between the Maximizer RAM and the main system RAM at a speed of 4 megabytes per second. The Maximizer is fully compatible with all current Cromemco system RAM memory cards (the 512MSU, 2048MSU, 256KZ and 1024KZ) but when using the error correcting memory cards (512MSU or 2048MSU) you must be certain to turn off the error-correcting option (through software) prior to any Maximizer operations. This is simply because there is no time for error-correction to take place during the fast DMA transfers. No such special precautions are required when using the Maximizer with 256KZ or 1024KZ memory cards.

FREE SOFTWARE

As a special promotion for the Maximizer, Cromemco — with its participating dealers, has announced that any customer who purchases a Maximizer prior to December 31 may have his choice of a free fast software package. This selection includes Fast Basic, Fast C, Fast Fortran, or Fast Pascal. These software packages will run under 20-series Cromix or 30-series Cromix Plus. The Maximizer is not yet supported under UNIX, although Cromemco does have plans to do so.

Since the fast languages list for $895.00 each (U.S. price), there is quite a savings to be had by purchasing a Maximizer prior to year end. And the sooner you put the Maximizer to use, the sooner you will see the speed increases that some of our users are now enjoying.

LANGUAGE	68000 C	68000 ASSEMBLER	MAXIMIZER MICROCODE ASSEMBLER
EXECUTION TIME (SECONDS)	26	10	0.5

Eratosthenes Sieve Benchmark Execution Times
for 100 iterations (in seconds)

HP Laserjet

Continued from front cover

as the European equivalents of letter and legal size). The paper can be fed from a paper tray or as single sheets. You can mix both letterhead and regular paper, and can even do envelopes. As for capacity, the paper tray can hold about 40 sheets. This means that you can print up to 40 pages unattended; for longer documents it would be necessary to refill the tray.

► Easy to maintain. Paper jams are rare, but when they occur are easy to fix. Adding new toner ("ink") is as simple as popping out one cartridge and putting in another.

► Easy to install. It uses a standard terminal cable. The printer connects to a serial port at 9600 baud.

► Letter Quality printing. There are 90,000 dots per square inch.

The printer itself weighs about 71 pounds. Its dimensions are 18.5 x 16.2 x 11.4 inches. While it is smaller than many printers, it would still take up quite a bit of space on someone's desk.

The Laserjet will need to be placed so that it is accessible on all sides. The paper tray is in the front, single sheets are fed from the back, the toner cartridge is inserted from the right side and the cabling and power cord are on the left side.

The operator control panel is on the front of the Laserjet. It displays its current status whenever it is on. A sampling of the status codes follows.

00 Printer Ready
02 Wait
05 Self Test
11 Out of Paper
13 Paper Jam
14 Request for different size paper
PF Feed paper manually
PE Feed envelope

The Laserjet, and other brands of laser printers, is essentially a copy machine. It is driven by a Canon Engine. The laser beam does not actually print directly onto the paper. Instead, it writes onto a selenium drum which forms a static electric charge at the point the beam strikes the drum. As the drum rotates, the static charge attracts the toner and places it on the paper.

There are various font cartridges available which allow the operator to select types of characters and to implement boldface and italics. Each font cartridge is essentially a set of software instructions telling the printer how to form each character. Depending on the type of cartridge that you want, the price ranges from $180 to $450.

It is fairly easy to use the various features of the Laserjet but can be tedious if you try to implement them without a program to help. For instance, to start underlining you would enter the following sequence: ESC '&' 'd' 'D'. To finish the underlining you would enter: ESC '&' 'd' '@'. In selecting fonts, you can select the symbol set, font stroke weight, font pitch, proportional pitch, font style, font typeface, and font height. Each of these items are entered using similar escape sequences. Only one font cartridge can be used at a time.

In order to avoid these complicated escape sequences, Excalibur Computers wrote a program called print. print allows you to use screen as your text editor and easily implement the features of the Laserjet. For example, to underline text, you would enter \u at the start of underlining and \u at the end of underlining. To change to italics, use \i, for boldface, use \B. To select specific fonts, you would enter a dot command. For example, .ft AA would select the first font on cartridge A. (HP assigns a letter for each different font cartridge). .ft AB would select the second font on cartridge A.

In Exhibit A, is a C program which will implement superscript, subscript, underlining, and boldface under Writemaster, using the Laserjet.

In addition to the features mentioned, the Laserjet can select the page length, set the top margin, set the text length, and do character positioning. Again, these are done through the use of Escape sequences.

The character positioning feature is very powerful. One excellent use of this is for printing labels. Exhibit B has an example of how the Excalibur print program can be used in printing labels, making use of the character positioning features. Comments are marked in /* */ and would not normally appear in a print program.

Other laser printers currently on the market include the Apple Laserwriter and the Ricoh LP-4080 Laser Printer.

About the Author:

Robert Brown *is in charge of Sales and Marketing for* EXCALIBUR COMPUTERS, *a complete systems house providing sales, service, and warranty repair and support for Cromemco products. In addition, he has been responsible for the development of the Cromix Excalibur Utilities, which includes the* print *program mentioned in this article.* EXCALIBUR *is currently at work developing a graphics driver for the HP Laserjet.*

EXHIBIT A

```
* Program name:  wmprt.c
*                place this program in the bin directory
*                it implements superscript
*                              subscript
*                              underline
*                              boldface  (implemented here as italics)
*                 for writemaster.
*
*              This patch is for use under CROMIX
*
*              To implement, debug or patch wmaster.bin.
*              Find '/bin/spool.bin' and replace with '/bin/wmprt.bin'.
*/


#include <stdio.h>
#define  ULCODE    1     /* character in writemaster used for underline */
#define  ESC      27     /* Escape character */
#define  CNTRLZ   26     /* End of file marker */
#define  LFUP      2     /* character in writemaster used for superscript */
#define  LFDOWN    3     /* character in writemaster used for subscript */
#define  BOLD      6     /* character in writemaster used for boldface */
#define  SO       14     /* used to select the secondary font */
#define  SI       15     /* used to select the primary font */

main (argc, argv)
int argc;
char *argv[];
{
 int i, j, flag = FALSE;
 int sfd, dfd, br;              /* Source fd, Destination fd, bytes read */
 int in_ul = FALSE;             /* in underlining currently?  */
 int in_bold = FALSE;           /* in boldface currently?     */
 char source_buf[512];
 char dest_buf[512];
 static char *argp[] = {                          /* used to spool prt.fil */
                        "spool",
                        "-d",
                        "prt.fil",
                        0
                       };

 if ((sfd = open(argv[1], READ)) == ERR)          /* open the source file */
    syserr("Unable to open source file\n");

 if ((dfd = creat("prt.fil", 0)) == ERR)          /* open the destination file */
    syserr("Unable to create prt.fil");           /* i.e. file to be spooled */

wrbyte(dfd, ESC);                /* send an escape sequence to the laserjet */
wrseq(dfd,")8U", 3);             /* sets the secondary symbol  set */
wrbyte(dfd, ESC);                /* send an escape sequence */
wrseq(dfd, ")s0p10h12v1s-3b3T", 17);  /* sets the secondary type to italics */
                                      /* THIS IS FOR FONT CARTRIDGE A */
                                 /* without the cartridge,
                                    this is not implemented */

while ((br =  rdline(sfd, source_buf, 511)) != ERR)  /* read the source file */
{
 for (j = i = 0; i <= br; ++i,++j)     /* test character by character */
  {                                    /* i for source, j for destination */

   if (source_buf[i] == CNTRLZ)        /* Test for end of file */
    {
     flag = TRUE;
     goto out_of_loop;                    /* if end of file, get out */
                                 /* I know, shouldn't use goto, oh well */    }

   if (source_buf[i] == ULCODE)          /* Test for underline code */
    {
     dest_buf[j++] = ESC;                /* write out underline sequence */
     dest_buf[j++] = '&';
     dest_buf[j++] = 'd';

        /* if I am already underlining, send the end of underline sequence
           otherwise send the begin underline sequence.  In either case,
           reverse the codes.
        */
     dest_buf[j]   = in_ul == TRUE ? '@' : 'D';
     in_ul =         in_ul == TRUE ? FALSE : TRUE;
    }
   else if (source_buf[i] == BOLD)       /* test for the boldface code */
    {
        /* if I am currently boldfacing, select the primary font,
           if not, select the secondary font, In either case, reverse
           the codes
        */
     dest_buf[j] =   in_bold == TRUE ? SI    : SO;
     in_bold =       in_bold == TRUE ? FALSE : TRUE;
    }
   else if (source_buf[i] == LFUP)       /* test for superscript */
    {
     dest_buf[j++] = ESC;                /* send the superscript sequence */
     dest_buf[j++] = '=';
     dest_buf[j++] = ESC;
     dest_buf[j++] = '&';
     dest_buf[j++] = 'a';
     dest_buf[j++] = '-';
     dest_buf[j++] = '1';
     dest_buf[j]   = 'R';
    }
   else if (source_buf[i] == LFDOWN)     /* test for subscript */
    {                                    /* send the subscript sequence */
     dest_buf[j++] = ESC;
     dest_buf[j]   = '=';
    }
   else
     dest_buf[j] = source_buf[i];        /* if it's none of those other
                                            things, it must be a regular
                                            character.  Put that
                                            character out
                                         */


  } /*  End of for loop */
 wrline(dfd, dest_buf);                  /* write the buffer to disk */
} /*  End of while, go back and read the next block */

 out_of_loop:           /* all done!! */

 if (flag == TRUE)      /* write out the last block */
  {
    wrseq(dfd, dest_buf, i);
    wrbyte(dfd, '\n');
  }

 close(sfd);             /* close the files */
 close(dfd);
 delete(argv[1]);        /* delete writemaster argument */
 if (( exec("/bin/spool.bin",  argp)) == ERR)
       error(STDERR);

}  /*  End of Main  */
```

EXHIBIT B

```
.co                     /*  Turn off the line counting feature */
.po 0                   /*  Set the page offset to zero */
.mt 0                   /*  Set the top margin to zero */
.mb 0                   /*  Set the bottom margin to zero */
.df temp.txt            /*  Open the data file "temp.txt"
                         *  The format of "temp.txt" is exactly
                         *  like the wordstar mailmerge data files
                         */

.rv COMP,CONT,STREET,CITY,STATE,ZIP,SOURCE,PHONE,FLAG
                        /*  Set up the variable names to be read
                         *  from the data file and read the first
                         *  line of data
                         */

.ig --------------      /* ig is "ingnore".  A comment line.
.ig First Block
.tr 6                   /*  Set the position to line 6 */
.tc 3                   /*  Set the position to column 3 */
&COMP&                  /*  Print the variable now in COMP */
.tc 3                   /*  Set the position to column 3, your are on line 4 */
&CONT&                  /*  Print the variable now in CONT */
.tc 3
&STREET&
.tc 3
&CITY&, &STATE&
.tc 3
                &ZIP&
.uv                     /* Update the variable list (read the next line)
.tr 6                   /* Same line, different column, same data type */
.tc 27
&COMP&
.tc 27
&CONT&
.tc 27
&STREET&
.tc 27
&CITY&, &STATE&
.tc 27
                &ZIP&
.uv

               /* etc.... filling every line and column on the page */
               /* etc.. */
               /* etc.. */

.tr 54
.tc 52
&COMP&
.tc 52
&CONT&
.tc 52
&STREET&
.tc 52
&CITY&, &STATE&
.tc 52
                &ZIP&

/* at the bottom of the page, the program goes back to the top
 * of the page and continues until there is no more data
 */
```

tec·tips

Tec Tips is a regular column aimed at providing hints for keeping systems up and running. It will not attempt to deal with specific engineering applications or non-standard configurations. Tec Tips is edited by Richard Quinn, owner of QUINTEC, a Southern California Computer service firm.

A Little More on STDC Disk Controllers

Much has happened and improved since the last time I wrote about the STDC card. The hardware and software has been improved and the whole STDC disk drive system is starting to take on the look and feel of a well designed and proven system.

The current version of operating system is important for proper operation of this card. This includes the proper version of STDC firmware. You can tell what version you have by looking at the ROM on the STDC controller card. The revisions range from 1.15 to the current level 1.23.

The newest version firmware is required for the latest releases of UNIX and Cromix-Plus. Starting with version 1.17 (I think this was the first to give this capability) the operating system could determine what version of controller firmware is present and down load via the /etc/iostartup.cmd file the latest version if needed. When booted, the firmware is loaded into the STDC's RAM memory and the ROM is disabled. This allows the STDC drivers to be dynamically changed on the fly giving greater operating system control over the disk drive.

If the version of the firmware on your STDC card is too old for the current version of your operating system, the new firmware is supplied on the distribution disk and loaded on boot. You cannot however boot directly to the STDC drive. You must boot to the floppy and run the iostartup utilities to down load the new drivers to the STDC and then do a WARM boot to retain the new drivers in the STDC. This double boot process is described in the SUDS notes that come with the new operating system. To save the double boot, simply install the newest version of the STDC ROM, version 1.23.

The STDC controller works with Z-80 CROMIX version 11.27, D series CROMIX versions 20.65, Cromix-Plus version 30.79, and UNIX release 2. (The version numbers are current versions as of this writing and there are earlier versions in all cases that also used the STDC. The current versions in all cases are the best.)

I use the INITSTDC version that is currently being supplied with Cromix-Plus version 30.79 to initialize the drive the first time. There are several reasons, the first being that this is the latest release of the program. It allows larger drives with better handling of alternate tracks and does a better job of prompting the user for needed information.

The earlier versions of the program allowed a maximum of 1023 tracks and some drives have more than this. For those who are using drives that are smaller, this was not a problem. But for those using larger drives or drives with less surfaces and more tracks, this was a problem.

The precompensation, required by some drives, is another area that gives some problems. As a drive steps to the inner cylinders of each disk (this is true of floppy as well as hard disks) each track going inward is slightly smaller in circumference (the distance around the circle) than the previous track until the inner most cylinder is the smallest. As such the data bits are much closer together on the inner cylinders than on the outer. Precompensation is used to electronically adjust for this difference in data density.

Some newer drives do not need precompensation. The only way you can tell which needs it and which do not is by the drive specs. Check the book and enter the cylinder where the manufacturer recommends starting of precomp. If no precomp is needed, enter the maximum number of cylinders on the drive. In other words, if the drive has 1024 cylinders and does not need precomp then enter 1024 for the starting cylinder for precomp.

Another area of concern is the number of alternate tracks. The media in a hard disk drive is fixed, and very high density defects are often present in newly manufactured drives. It is almost impossible not to have a few defects in the higher densities and that is why alternate tracks are declared. When a reference is made to a specific track that has a defect previously declared, the operating system actually reads the alternate track instead. Alternate tracks are usually the highest tracks on the drive.

The STDCINIT program does an init/read to determine if any defects exist at the time of initialization. This is not always perfect as defects may exist that are not detectable at the time of initialization. Some are defects of retention — that is, the surfaces will lose their magnetic information after a short time and therefore be illegible at a later time. It is always best to use the list of defects supplied with the drive from the manufacturer. Declare the surface and cylinder as INITSTDC asks for it.

There are some tricks I have learned while working with the STDC and several different manufacturers drives. The first one is a bug in the way the init program works. The first thing INITSTDC does is to try to read the disk label stored on cylinder 0, surface 0, which, by the way, is the only cylinder/surface that must be defect free on a drive. It cannot be declared to an alternate as it is what tells the system where the alternate track table is located.

Often times when initializing a new drive without a label on this track a user encounters a "must initialize STD31 first" message. This is the device driver that allows the whole drive to be initialized. Since any STDC type hard disk drive can be segmented into as many as 32 segments, regardless of overall size, Cromemco has used the last segment device name to refer to the entire drive during initialization. This is of great help later on in cleaning up a damaged segment. I'll cover this a bit later.

Anyway, the first time the drive is formatted you must format it as device STD31 (STD0 through STD31 for a total of 32 segments) to create the label and to have INITSTDC prompt you for all of the drive specs. It is also at this time that you declare partitions, if any are desired. If you do not declare partitions the drive will be referred to as device STD0. If you declare partitions the first partition is referred to as STD0, the second STD1, etc. I usually declare partitions in the 20-25 meg ranges so they will all fit on a single tape in the CTD backup system. It is up to the user to decide what partitions, if any, are desired and what are convenient sizes. (Different rules apply for UNIX so pay attention to instructions for UNIX.)

If you get a message like "device not found STD31" then create the device using the command makdev /dev/std31 b 6 31. If you get the error message "no device driver STD31" then you will need to re-gen the operating system for 32 partitions in order to have a driver for STD31. After initializing the drive, re-gen the operating system for the number of partitions declared to save memory being given to drive partitions that don't exist.

INITSTDC in all cases supplies as default values its best guess for the drive that you are using. In general this is a Cromemco HDD-50. But Cromemco also supplies a 20 meg and a 140 meg drive. You MUST know what you have or you will never get the drive right. Use the manufactures spec sheets for the information.

INITSTDC also asks as its last question: if you want to verify; the default is yes. If it is the first time a drive is initialized, or the label has been destroyed due to some damage or system crash, answer no to verify. If you don't, the

system will come back and say "cannot initialize track 0". If you have done it once, you cannot get past this point until you re-boot the system, as the STDC controller remembers its earlier attempt and continues to give the same error. To save time, I tell it to do the first 10 or 12 tracks only with no verify and follow that with a re-run of INITSTDC with verify on for the whole drive. When running INITSTDC the second time all defaults that were entered will appear as the default answers as the drive now has a label and the values are automatically determined from the previous partial initialization.

If the drive develops soft errors later (a soft error is one that will go away after init is run on it — a hard error stays and must be declared in the alternate track table) INITSTDC can be run on only that segment and the defaults will be for the group of tracks that are in that segment. You cannot re-declare alternate tracks, but you can clean up that segment without damage to data on other segments.

It has been my experience that drives that are in good working order rarely, if ever, develop new defects from the originals. Therefore, even though INITSTDC calculates an average number of alternate tracks for a given drive size, I usually declare only 5 or 10 more than those I know are defective from the defect list supplied at the time the drive is tested by the manufacturer. In this way, I don't take up drive space with unused alternate tracks.

The system locates the alternate track table in the middle of the drive but will allow the user to specify where the table will be located if desired. The value of locating it in the middle is to minimize average access to it from maximum tracks to minimum tracks.

One other little bug with INITSTDC, that I have not been able to determine from whence it comes, shows up as follows. Often the first time a drive is initialized (assuming that you have not set verify on as described above) the program says "drive failed" and drops you back to the operating system. Simply run the program again giving all the same information and it works the second time through. I don't know what the bug is, but it is not a big problem if you recognize it.

If the drive seems to work all right at first, and then develops many read or write errors, the problem is often that the location for precomp has been entered wrong and the drive develops problems after the cylinders below the precomp area are used and the system starts into the upper tracks. Even though INITSTDC calculates an approximate starting cylinder for precomp, I believe it is very important to know what it is for your drive and install the correct value, not an approximation. This is especially true of drives that do not need precomp. Specifying a cylinder that is less that the maximum cylinder will almost always cause unreliable operation in such a drive.

I like to test a drive by loading all of the distribution disks for the operating system onto it, and then create as many directories as needed to completely fill the drive. I use /test1, /test2, /test3, etc and then cptree / /test1, / /test2, etc until I get a disk space full error. This will confirm the quality of the drive while giving it lots of seeks, reads and writes. It is also easier to fix a problem, re-init the drive, or declare additional alternate tracks before loading the drive with lots of data that is in use and will be lost if not backed up. It also saves frustration in loading a lot of data only to find a problem that requires starting over.

Loading CROMIX onto the disk only takes 10 or 15 minutes and can, when copied to itself, fill the drive with data in short order. I run check after each copy, and after I use deltree to delete the temporary directories, to prove proper operation. Remember, each temporary directory will be inclusive of all previous directories — so this method will fill even a large drive fast.

Test Against STDC and RAMDISK

There is in all 68000 CROMIX versions the ability to create a RAMDISK—allocating RAM memory for use as a disk like device. The methods of creating and using the RAMDISK differ between versions of CROMIX but essentially are the same.

We ran several simple benchmarks not intended to be conclusive, but the results were surprising. The STDC controller was just as fast as RAMDISK at loading and running programs repeatedly. I don't know if this is because the STDC is fast or RAMDISK is slow but suspect that is partly both.

The exception was when there were multiple users where "head contention" was a problem: RAMDISK was faster. Head contention, simply put, is when more than one user is accessing the disk at the same time and the drive is forced to move to drastically different areas causing many mechanical relocations of the head for each user. RAMDISK was faster because the "seek time" is zero. If you know the nature of your users, efforts to define and properly use RAMDISK and regular disk will result in the best performance.

By the way, the above tests were easily done using a new Cromix-Plus utility called clock. Enter clock and any normal command line and the system will tell you how long the process took in real time and in CPU time — a handy utility to test the speed of a program and make real speed improvements.

A New Cromix-Plus is on the Horizon

A new version of Cromix-Plus supplying WDI hard disk drivers and SMD drivers is in beta testing now. It seems to be faster overall as well, but we have only had it for a few days.

Cromix-Plus, a Truely Superior Operating System

I wish that Cromix-Plus had been developed three or four years ago. It is

truely superior. I know that time, money and normal evolution prevented it from coming sooner, but I fear that with all the UNIX demands, an otherwise great system will be lost.

There are many features that you always wanted and now have. The greatest feature is its efficient use of memory. Efficient use means using enough that the operating system is efficient and not so much that it is wasted. It also means allowing an extensive gen system so that a user does not carry overhead for things that will not be attached to the system.

Cromix-Plus allows a user to define how many of what type devices will be used. In addition, a knowledgeable user can define the number of terminals on line, number of resident memory inodes, system cache memory, and other parameters. Careful consideration of these parameters can greatly improve the system's performance.

Other things that I find very nice are the ability to check the mode of block devices (disks, tapes, etc.) as well as character devices. The mode on a block device shows RPM, and hard and soft errors. This is of great help in locating problems or potential problems. I know of no other system that allows for these advanced features.

The new /gen/sysdef file used to generate a custom system is a great way to self-document what features were setup in the system. This allows a dealer or system manager to set up the system and leave a file that can be modified for added hardware at a later time.

Problems with the CTD Tape Backup

If you have had some problems with the CTD tape drive in backing up and restoring reliably, be certain that you are on SUDS and get the latest updates. The newest version of Cromix-Plus is equipped with better drivers for the tape drive which have done away with most of the earlier problems. I look for more improvements on the CTD drivers and utilities. CD

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Soft Tips

Soft Tips is a regular column aimed at providing software oriented hints and ideas for non-programmers. Members are encouraged to send in tips that can help a user better use his/her system. Soft Tips is edited by Norman Vadnais, President of Computer Specialists & Associates, an Orange County Customer Support Specialist. Member's contributions can be sent to Soft Tips in care of *I/O News*. Mr. Vadnais can be reached at (714) 841-3620.

Editor's Note:
Thanks again to Gerald Reynolds *for this interesting technique for interrupting COBOL, FORTRAN, or PL/I-80 programs.*

For users who have longed to be able to interrupt a long-running COBOL or FORTRAN program from the keyboard — to get its attention for any reason — here is a simple CP/M Z-80 assembly language routine that will do it (provided the program isn't in a runaway loop that never calls the routine).

```
        ENTRY   KEYHIT
KEYHIT: LD      (HL),'N'        ;assume no key has been hit
        LD      C,11            ; test keyboard status
        CALL    5               ;BDOS — returns -1 in reg
                                ;A if key was hit
        RLA                     ;test if zero
        RET     NC              ;if so, return to caller
        LD      (HL),'Y'        ;else flag key hit
        RET                     ;done, return to caller
        END
```

This routine must be assembled and linked to the COBOL or FORTRAN program that is to be interrupted. To use it with COBOL, define a 1-byte variable, say 01 KEY-HIT PIC X, and CALL 'KEYHIT' USING KEY-HIT. If the result in KEY-HIT is 'Y' a key was hit, and the program should branch to interrupt-handling code. This call would typically be placed within a loop that performs other tasks, to be able to interrupt the loop. This technique provides a synchronous interrupt, one that always occurs at the same place relative to other processing. (An asynchronous interrupt is difficult, if not impossible, in general in CP/M with COBOL, but is easily done with the Cromix signal facility).

In FORTRAN, declare KEYHIT an EXTERNAL subroutine, and call it passing a 1-byte (LOGICAL) parameter. Test the parameter value on return, as in COBOL.

The routine given above assumes the subroutine paramter addressing mechanism of Cromemco COBOL and FORTRAN. The addressing mechanism for Digital Research's PL/I-80 (a very nice product) is somewhat different, and the routine needs to be modified. Here's the change to the routine for PL/I-80:

```
        ENTRY   KEYHIT
KEYHIT: LD      A,(HL)          ;get parameter address
        INC     HL              ; pointed to by (HL)
        LD      H,(HL)
        LD      L,A
        LD      (HL),'N'        ;assume no key has been hit
```

(other statements as before — no change)

In PL/I-80, declare KEYHIT ENTRY (CHAR(1)), and a 1-byte variable, say KEY-HIT CHAR(1), and CALL KEYHIT (KEY-HIT). On return, test the result as in COBOL.

For those who need to use 8080 assembler (RMAC only — ASM and MAC do not produce relocatable code), the code for the PL/I-80 interface is:

```
        PUBLIC  KEYHIT
KEYHIT: MOV     A,M             ;(comments as before)
        INX     H
        MOV     H,M
        MOV     L,A
        MVI     M,'N'
        MVI     C,11
        CALL    5
        RAL
        RNC
        MVI     M,'Y'
        RET
        END
```

Now a caveat or two. First, for those who tinker with assembler, particularly under Cromix. The system uses the two bytes just below the stack for its own private purposes. Anytime a read from disk overwrites these two bytes, the program will be promptly aborted. And if the stack pointer address is ever set higher than the address at memory location 6-7 the program will be aborted. Thus, it is not possible to return to the operating system, rather than jumping to it, at the end of the program, as some CP/M programs do to avoid a warm boot.

Second, if users, or potential users, of Cromemco's Z-80 COBOL feel they have any choice in the matter, I would suggest they look into the Microsoft COBOL-80, from which Cromemco's version is adapted. For a bit more money users of COBOL-80 can have the COBOL embedded SORT verb, which is not included in the Cromemco COBOL. (The Cromix SORT utility cannot sort COBOL data files — without special modification — and no sort facility is offered at all for CDOS). COBOL-80 will run on any CP/M machine, while Cromemco's version will run only on a CDOS machine. (CDOS includes Cromix with CDOS simulator; CP/M includes CDOS or CROMIX with CDOS or CP/M simulator). For users who have or might be getting a Cromemco machine with the CP/M operating system, or a CP/M simulator for their Cromix system, this will be a significant point. I/O

New 32K SBASIC

Continued from front cover

programs easier to write. The Cromix and MS-DOS versions offer many extensions to make use of the advanced features of those operating systems and provide more memory for user programs. Full path names for data files and programs are supported.

To make programs more portable between all the operating systems, slashes and colons in files and programs are logically translated. Provisions are made for calling operating system commands and utilities and running other programs from Structured Basic. The maximum data file size is extended to 1024 megabytes.

A very fast built-in spooler handles output to any desired printer and allows multiple copies of reports to be printed automatically. Buffered block I/O rather than single character I/O increase speed ten fold. Since the system spooler does not have to be used, printouts start as soon as a printer is free after the printer channel is closed. Direct, unspooled output to any printer is also allowed.

For software developers an SBASIC program is provided to render a saved program unreadable by actually destroying those parts of the program that are not necessary to run it. Make sure you have a copy of the program somewhere before attempting this operation. There is no way to reverse the process.

With the enhanced Cromix version, users will find that their systems can acceptably support several more users running Structured Basic applications. Using the Cromix lock system call, Systems Atlanta has developed true multi-user applications with Structured Basic.

The most significant of these new versions is that for MS-DOS. It is almost completely compatible with the Cromix version, even though written for a different microprocessor chip and different operating system. The logic of the original Z80 version was carefully followed. Where features of the 8086 series microprocessor made it possible, the code was improved. Occasionally, the reverse was required. The chief objective of the project was to make it possible for software developers to move software written in Structured Basic to the IBM PC without any conversion effort.

Perhaps hundreds of fine software packages have remained relatively unknown because they could only be run on Cromemco systems. Some of these have been converted, with much effort by their authors, to Microsoft Basic as the popularity of the IBM computer swept the country. Such conversions are now no longer necessary. Saved and protected programs may now be moved directly from Cromix systems to PC or MS-DOS systems with no change.

Because of the great popularity among all programmers who have used it, Cromemco Structured Basic also may increase in use and popularity in the IBM world. The Systems Atlanta MS-DOS version has been tested on many IBM-compatible microcomputers with no problems. The package is available for immediate delivery at $295 with significant dealer and various institutional discounts. Address inquiries to:

Systems Atlanta, Inc.
P.O. Box 99
Lebanon, GA 30146
(404) 928-0240

Inside CROMIX

Inside CROMIX is an open forum on both eight-bit and 16-bit versions of CROMIX. The subject matter is directed towards helping CROMIX users derive more from their systems. Members' contributions are invited. Inside CROMIX is edited by William Jaenicke, Editor of *I/O News*, who can be reached by phone at (714) 661-9764.

Editor's Note:

Thanks this issue to Gerald R. Reynolds, *DP Manager and Chairman of the Science Faculty at Helderberg College, R.S.A., for the following contribution. The techniques illustrated in his article can be applied to many diverse applications, under any version of Cromix (Z-80, D-series and Cromix-Plus). Although this command file "driver" is specific for compiling Z-80 Cobol, the same method and logic could be applied to drive the compilation of C, Fortran, or Assembler programs.*

I would like to share some tips and techniques in regards to writing command files for Cromix. For the first example, I have included a driver for Z-80 Cobol version 4.64. We've been using this driver for over a year; it's very handy, and it illustrates some useful techniques in their own right. It validates the directory it's running in, scans for three control parameters that may be passed to it, building command files to drive the compiler and linker as specified by the parameters, executes the compiler driver command file, asks whether to proceed with linking, conditionally executes the linker driver command file, and ends by cleaning up after itself. It also prompts with a syntax message if there are too few or too many arguments. I've numbered the code lines for reference in the explanation following the code.

```
 1  d > test
 2  testinp -d test /usr/pkg/cobol
 3  if -err goto ok
 4  echo "This command may not be executed from"
 5  echo "within the /usr/pkg/cobol directory."
 6  ex
 7  %ok
 8  if #1. = . goto err
 9  if #5. != . goto err
10  %scan
11  if #2. = . goto tty
12  if #1. = -l. goto lst
13  shift
14  goto scan
15  %tty
16  echo -n "/usr/pkg/cobol/cobol , TTY: = #1/R" > cob.cmd
17  % echo > cob.txt
18  goto dtest
19  %lst
20  shift
21  if #2. != . goto lst
22  echo -n "/usr/pkg/cobol/cobol , LST: = #1/R" > cob.cmd
23  % echo "> * /dev/prt" cob.txt
24  % echo "echo  ^L > /dev/prt">> cob.txt
25  %dtest
26  rewind
27  maklink -f /usr/pkg/cobol/debug.rel .
28  %testd
29  if #2. = . goto nodebug
30  if #1. = -d. goto xtest
31  shift
32  goto testd
33  %nodebug
34  echo -n "/D" >> cob.cmd
35  del debug.rel
36  %xtest
37  rewind
38  %testx
39  if #2. = . goto exclude
40  if #1. = -x. goto include
41  shift
42  goto testx
43  %exclude
44  echo -n "maklink -f /usr/pkg/cobol/cobloc " > link.cmd
    echo "/usr/pkg/cobol/coblbx.rel ." VV link.cmd
45  if -r debug.rel goto exdbg
46  echo "/usr/pkg/cobol/link #1/N,#1/E" >> link.cmd
47  echo "del cobloc coblbx.rel">> link.cmd
48  goto comp
49  %exdbg
50  echo "/usr/pkg/cobol/link #1/N,#1,debug/E">> link.cmd
51  echo "del cobloc coblbx.rel debug.rel">> link.cmd
52  goto comp
53  %include
54  shift
55  if #2. != . goto include
56  echo -n "/X">> cob.cmd
57  echo "maklink -f /usr/pkg/cobol/coblib.rel ." > link.cmd
58  if -r debug.rel goto indbg
59  echo "/usr/pkg/cobol/link #1/N,#1/E">>link.cmd
60  echo "del coblib.rel">> link.cmd
61  goto comp
62  %indbg
63  echo "/usr/pkg/cobol/link #1/N,#1,debug/E" VV link.cmd
64  echo "del coblib.rel debug.rel" VV link.cmd
65  %comp
66  % ty < cob.txt >>cob.cmd
67  % del cob.txt
68  % If the commented code above is used, delete the next line.
69  echo >> cob.cmd
70  maklink -f /usr/pkg/cobol/cobol[1-4].ovr .
71  cob
72  del cob.cmd cobol[1-4].ovr
73  echo
74  mode cb
75  echo -n "O.K. to link? If any errors, answer NO. (Y or N)? "
76  input > answer
77  echo
78  mode -cb
79  testinp -fd answer y
80  if -err goto done
81  maklink -f /usr/pkg/cobol/crtdrv.rel .
82  link
83  del #1.rel crtdrv.rel
84  %done
85  del link.cmd
86  ex
87  %err
88  echo "Wrong number of arguments"
89  echo "Syntax: COBOL [-L] [-D] [-X] PROGNAME"
```

This code assumes that the compiler, linker, and all required auxiliary files are in the directory /usr/pkg/cobol. Lines 1-6 assure that the user cannot be in this directory (only a slight change would be required to assure instead that the user is in a particular directory). Lines 8 and 9 test for too few and too many arguments, and branch to the syntax message, lines 87-89. Note that the syntax message assumes that the driver is called cobol.cmd and is in the /cmd or current directory. The main body of the driver begins with line 10.

The loop in lines 10-14 scans for a -L parameter. If it is not found (line 11) the compile listing is sent to the screen, else (line 12) the listing is sent to the printer. The code at lines 16 and 22 begin to build the compiler driver command file. The echo is without a return (-n) because other parameters may be ap-

pended to the line before it is complete. The code at lines 17 and 23-24 is commented out because we don't use it, but it may be used to send the "error output" to the printer as well; this includes the 2 lines of compiler identification at the start of compilation, on a page by itself, and the error count at the end of compilation (it's a pity, in my opinion, that these don't go to the standard output). Line 24 echoes a form-feed, CTRL-L, to the printer at the end of the job, to eject the forms. When typing this line with the SCREEN editor, the CTRL-L must be entered by typing a backslash,\, before typing CTRL-L. The loop in lines 19-21 makes sure the parameters passed to #1 in line 22 is the program name, not another control parameter. Even though #1 is between quotes, the program name will be substituted for it and echoed to cob.cmd.

Beginning at line 25, the parameters are scanned again, this time for a -D. The meaning of -D is to INCLUDE debug code, so line 27 assumes that it will be included. If -D is not found (line 29), debug.rel is deleted again (line 35). Later, lines 45 and 58 determine by its presence or absence what to write to link.cmd. Some users may want to omit line 34. Including it makes a smaller .com file, but it also has the effect that error messages at run time cannot report the source line number where the error occurred, so they always report line 0. This makes it more difficult to track down the error.

Beginning at line 36, the parameters are scanned yet again for a -X. The meaning of -X is to use the /X switch in the compiler command line (see line 56), for the embedded runtime option. The code following line 43 is selected if -X is not used, else the code following line 53 is selected. These sections of code set up the linker driver, link.cmd, with the proper instructions.

After the three scan loops just described, the logic leads to line 65. Lines 66-68, commented out, would be used if lines 17, 23 and 24 are uses, else line 69 would be used. These lines complete the compiler driver, cob.cmd, which is then invoked at line 71, and deleted at line 72.

Lines 73-78 ask the question in line 75 in such a way that the user can answer it with a single keystroke, without having to press Return. Line 76 captures the answer, line 77 confirms visually that it was captured by echoing a Return, and line 79 tests the answer and deletes the temporary file. If the answer was not Y (the test is case-insensitive), linking is bypassed (line 80) and the generated linker driver, link.cmd, is deleted (line 85).

We use line 81 because we have removed the CRT driver (CD3102) from coblib.rel and coblbx.rel and placed a single copy in crtdrv.rel, for easier modification and substitution of a different driver, and because the compiler generates code to search crtdrv.rel, so the linker likes to find it as a separate file.

Line 82 runs the linker driver, link.cmd. Line 83 deletes the .rel file and the CRT driver. We normally discard the .rel file after linking unless it is one of a group of modules that must be linked into a single run unit; when this is the case we simply answer No to the question whether to proceed with linking, and the .rel file is then saved, and we do the linking separately (under control of another command file does not delete the .rel files after linking).

Though line 89 suggests a particular order for the control parameters, they may be entered in any order. However they must be entered separately, not, for example, as -LDX, as permitted by many Cromix programs. The program name must be supplied without a filetype suffix; the compiler and the linker assume the proper suffixes to complete the name.

The next example validates a user name and requests a password, allowing only three attempts. Again, the lines are numbered for later explanation.

```
 1  who am i > answer
 2  echo -n "f' 'zceeu" > command
 3  screen answer < command > /dev/null
 4  del answer.bak command
 5  testinp -d answer "joe"
 6  if -err goto quit
 7  echo -n "1" > count
 8  %tryagain
 9  mode -ec
10  echo -n "Please enter your password: "
11  input > answer
12  echo
13  mode ec
14  testinp -dr answer "password"
15  if -err goto ok
16  echo "Invalid password"
17  testinp count "1"
18  if -err goto 2
19  echo -n "2" > count
20  goto tryagain
21  %2
22  testinp count "2"
23  if -err goto quit
24  echo -n "3" > count
25  goto tryagain
26  %ok
27  echo "Any program name"
28  goto exit
29  %quit
30  echo "Sorry, you may not run this program"
31  %exit
32  del count >* /dev/null
```

Lines 1-6 test the user name — Joe in this example — the test is case-insensitive. In line 1 the user login name and some other information is captured. Line 2 sets up a command string for screen which will cause it to find the first space in the file and delete everything at and following that space. Line 3 does it, and line 4 cleans up after it. As a result, line 5 is able to test whether the user login name is Joe. If not, the user is prevented from running the program which this command file is protecting.

Line 7 initializes the count to give three tries at the password. Lines 8-13 accept the password, with echo off, so it is not displayed as it is entered. Line 14 tests the password (here password is used as the password, but it may be anything). If the test is satisfied, the protected program is run, else the count is tested to determine whether the user gets another try. If the count is "1" at line 17, it is changed to "2" at line 19 and the user is permitted to try again, else a branch is made to line 21, where the same logic is followed in testing for "2" and changing it to "3". If the test for "2" fails (line 23) then the value is already "3" and the user has had his last chance.

User Notes

Editor's Note:
Paul Lee, of Canadian Union College in Alberta, Canada, related the following set of experiences regarding the STDC Hard Disk Controller, CP/M Editors, and 2MB Memory Boards.

STDC Tips

We have a System Two running under 68000 Cromix-Plus with dual hard disk drives. Due to budget restrictions we purchased our drives from mail order electronic suppliers. With the STDC controller we have successfully installed three different ST506 drive makes. These are:

- 25MB Seagate ST225 (615 tracks, 4 heads, write/precomp at 300)
- 19MB Tandon TM503 (305 tracks, 6 heads, write/precomp at 153)
- 6.7MB Shugart SA604 (160 tracks, 4 heads, write/precomp at 128)

The SA604 is a surplus item (Shugart quit manufacturing hard disks) and is available for $99 at several electronic mail order distributors listed at the back of BYTE magazine. We found that it doesn't have to cost a great deal to step up to 68000 Cromix. I have OEM manuals for all these drives and would be glad to pass on any info to anyone needing it.

I wasted a lot of time getting things operational, perhaps I could pass on a few cautions (confessions).

If you are making your own STDC to HD cables make sure not to accidentally invert them or it may mean a STDC repair (oops).Apparently the STDC is not as forgiving to such mistakes as the FDC boards.

There is another unique problem that can arise especially when using dual hard disk drives under Cromix-Plus. The instructions to handle one drive are barely enough. With two drives, things can get hairy. If something goes wrong with formatting the disk or loading the stdcfirm onto the disk, Cromix-Plus may refuse to do anything with the drive, even to reinitialize it. Typically you may get "not a Cromix-Plus disk" or "disk error, cylinder xx, head yy etc." The one solution I found to this problem is to reboot my old Cromix 20.63 version off a floppy and use the initstdc program from there. Then Cromix-Plus will accept the drive and you can proceed.

Here is the suggested procedure for initializing and setting up Cromix-Plus STDC drives.

For your first drive boot up Cromix-Plus in a floppy system and use the initstdc utility with STD31 as the device. Make a file structure with makfs std0. Then give the command /etc/stdload /etc/stdcfirm std0. This needs to be done only once to the disk and not every time you boot. I strongly recommend deleting that command from the /etc/iostartup.cmd file, since it needs to be done only once to the disk.

The second drive can be initialized the same way except that you initialize device std63 and make file structure to std32.

The stdcfirm is then loaded with /etc/stdload /etc/stdcfirm std32. Again make sure the /etc/stdload /etc/stdcfirm std0 command is not on the root floppy (iostartup.cmd) that you boot with or you get that unique predicament mentioned previously. If the wrong stdcfirm gets loaded on the drive by accident you can use Cromix 20.63 initstdc to start over again. That's why I recommend loading stdcfirm only once to the drive.

Passing pathnames to CP/M editors

I personally find the screen editor lacking in some respects. It is not as quick an editor since it does not fully utilize the features of many terminals. In addition it is menu driven rather than with control characters which tends to slow things down. Also, there are no macros (when will Cromemco rewrite screen in 68000 code for 68000 Cromix ?).

I have used the Compuview Vedit editor in CDOS for several years and find it more satisfactory. Typically CP/M editors use I/O polling and this tends to slow the display considerably. The Vedit has an interrupt driven I/O option, which in 68000 Cromix makes its scrolling about as fast as screen. I have clocked a page display at 2.5 sec for screen and 2.8 sec for Vedit setup in the interrupt mode. Without the interrupt feature (normal CP/M polling) Vedit takes about 5.5 sec for same display. There are several other additional features of Vedit, many of which result in a considerable speed advantage over screen. For example reverse scrolling, line insert, faster search and replace, word wrap option, line and column display, macros, specifying input and output files in command line, customized keyboard layout, etc.

The main advantage of screen over CP/M editors is its use of pathnames. However, due to the powerful versatility of Cromix this can be accomplished via a command file. Below is a listing of a command file edit.cmd that will simulate pathnames for Vedit. This can be rearranged for your own favorite CP/M editor. The Vedit editor is named edt.com and is located in the /bin directory. The comment lines may be deleted to save space.

```
if #2. = . goto one
% different input and output pathnames
ren #1 b$$
if -err exit
/bin/edt b$$ a$$
ren b$$ #1
ren a$$ #2
if -err exit
/bin/cdosfix #2 > * /dev/null
exit
%one
% same input and output pathnames
ren #1 a$$
if -err exit
/bin/edt a$$
ren a$$ #1
ren a$$.bak #1.bak > * /dev/null
/bin/cdosfix #1 > * /dev/null
```

Macrotech 2MB MSR-II Memory Board.

We have one of these memory boards and it seems to work fine in our Cromix-Plus system. It is a good buy at about $1300. One distributor is the S100 Corporation in Scottsdale, Arizona. In Canada it's available from Dynacomp in Vancouver.

Cromemco Users Group for Alberta Canada (and western provinces).

I am interested in helping to form a Cromemco users group for the province of Alberta and perhaps including Saskatchewan and B.C. Anyone interested can contact me and see if we could get one going. You can write to me or phone. If you have a modem you can dial into our Cromix-Plus system (403-782-2955, hit several CR to establish baud rate) and login as guest. You can leave a message with the menu selection 1. Ignore other options.

Paul Lee, Instructor,
Physics and Technology Dept.
Canadian Union College
College Heights, Alberta
Canada TOC OZO
(403-782-3381 ext.222)

FOR SALE

Cromemco System 3, with Persci 8" dual disk drive, 10 meg HDD and Adds Regent 25/120 Terminal. Includes Z80-ZPU, PRI, 4FDC, WDI, 3-64KZ and TU-ART boards and Cromix 10.09, 32K BASIC, COBOL and Data Base MGT software. Unit installed in attractive 3'X 5' desk cabinet. Excellent condition. $3200.00. Call (213) 498-8187

Computer Items For Sale:

16FDC, 64KZ, 256KZ, ZPU, STDC (rev. C mod. 13), Tandon TM503 19.2MB hard disc drive (for use with STDC), SD ram III 256K, Cromemco Spellmaster software (SPMR-S), Cromemco Word-processing System (WPS-S), a number of Cromemco manuals (you name it), Diablo 1620 printer (for parts), Tandon 848-2 disc drive (for parts). Best offer. Will consider trades.

Wanted' H/Z 19 terminal or equivalent.

Contact: Paul Lee, Box 511, College Heights, Alberta, Canada TOC OZO. (403/782-3381 ext. 222, or leave recorded msg. at 782-5734)

bits & bytes, nibbles & tweaks

WHETSTONE BENCHMARKS

The Whetstone benchmark program has become an industry standard for the evaluation of computer languages, particularly for determining floating-point performance for the FORTRAN language. Ratings are assigned in terms of so many Whetstones over so many seconds: the higher the number of Whetstones the greater the performance. For a complete definition refer to Curnow HJ and Wichmann BA: "A Proposed Benchmark for Hardware Evaluation: The Whetstone Program," The Computer Journal, no. 1 (1976).

The rapid evolution of microprocessor power becomes evident in the following table:

Whetstone Benchmark

CPU	Board	Whetstone/Second
ZPU	Z80 4MHz	7,800
DPU	68000 8MHz	40,000
XPU	68010 10MHz no coprocessor	50,000
XPU	68010 10MHz with Cromemco FFP	178,000
XPU	68010 10MHz with Maximizer	277,000

INTEGER-BENCHMARK

Dr. Manfred Ries, of the Department of Applied Mathematics at Trier University in West Germany provided the following BASIC program for generating prime numbers. Using this program, he compiled the set of results shown in Table 2.

```
 1  Rem Integer-Benchmark: BASIC version
 2  Integer I : Dim Prim(1000)
 3  Prim(1) = 2
 4  Prim(2) = 3
 5  Ianz = 2 : Input Inum
 6  Kand = 5
 7    For I = 1 To Ianz
 8    If Prim(I)*Prim(I) V Kand Then 13
 9    Ir = Kand-(Int(Kand/Prim(I)))*Prim(I)
10    If Ir = 0 Then 15
11    Next I
12  Stop
13  Ianz = Ianz + 1
14  Prim(Ianz) = Kand
15  Kand = Kand + 2
16  If Ianz V Inum Then 7
17    For I = 1 To Inum : @ Prim(I) : Next I
18  Stop
```

Dr. Ries also contributed a number of other interesting programs and observations. Among other things, he has developed timer programs for CDOS and 68000 Cromix which enable accurate measurement of the performance of entire programs, or subroutines and functions within the program, and thereby allow the programmer to fine-tune it for optimum speed. These utilities were necessary in optimizing code for his studies into Solutions of Boundary-Value Differential Equations (using Finite Elements and Multigrid Methods), Semi-Infinite Programming, Solution of Transport Problems, and Statistics. The source code for these timer programs is available from him for a small fee.

In addition, Dr. Ries has expressed an interest in forming a local Cromemco Users Group in Germany. If you are interested in any of the above, his address follows:

Dr. Manfred Ries
Angewandte Mathematik
Fachbereich IV
Universitat Trier
D-5500 T R I E R
West Germany

TABLE 2
Results of Integer-Benchmark

Machine	Program		Number of (seconds) 100	1000	Primes 10000
Apple II	FP-Basic		33	805	
	TASC-Compiler V2.0		13	325	
	UCSD-Pascal		8.7	223	
	UCSD-Fortran		8	200	
Cromemco	Cro. SBASIC		30	772	
	Cro. FORTRAN/LINK		1.6	37	
	Turbo-Pascal	Integer*2		25	
IBM-PC	MS F-77 3.20	Integer*2		6.6	
		Integer*4		16.9	
IBM AT 80287	Basic 3.00			7	113
IBM AT 80287	MS F-77 3.20	Integer*4		5.3	183
IBM XT/370	IBM—VS-Fortran	Int*2		7.8	
		Int*4		8.8	209
Cromemco	FORTRAN-77	Integer*2 ECC on		2.4	
68000/8		Integer*4 ECC on		9.68	240.7
		Maximizer *4		3.42	87.1
IBM /4331	Fortran-H Opt(2)		0.10808	1.6075	38.4
UNIVAC 1100/60	Fortran—Opt				10.83
IBM /370-168	Fortran-H Opt(3)		0.00496	0.12541	2.912

Interpretation of this table is left to the reader. You should notice, that all calculations are done in Integer.

DR. GARLAND TO ADDRESS MUG

Dr. Harry Garland, President of Cromemco, is scheduled to speak at the November 20th meeting of the Microcomputer Users Group. All Cromemco users are invited to attend.

For more information, contact Noble Bright:

Microcomputer Users Group
of New Jersey, Delaware & Pennsylvania
P.O. Box One
Cape May, NJ 80204-0001

THE RUMOR MILL

► Rumor has it, from a very reliable source, that Cromemco will be by late fall offering a high-resolution bit-mapped graphics terminal suitable for CAD/CAM and related applications.

► Where is that MS-DOS/CDOS disk format conversion utility that everyone seems to want, but nobody has produced? Its in the works according to Mike Hazen of Quintec Services, Inc., and should be available within the next few months. Price? Under $100 (US).

► The word is that there is a new processor board in the works at Cromemco which will feature the MC68020. As those chips have yet to become available in mass quantities, we probably won't be seeing the new CPU board until sometime later next year. What will it be named? Well, there's already the ZPU, the DPU and the XPU. So in all likelihood, it will probably end with a "U" — UPU?? YPU?? XXU?? We'll just have to wait and see.

CORRECTIONS & UPDATES

► **Bob Staudenmaier**, author of "Improving WordStar Performance under Cromix," changed address since

publication of *Vol. IV, No. 5*. Anyone wishing to contact him in regards to the article can reach him at 325 Ellwood Beach Dr., Apt. 15, Goleta, CA 93117; telephone: (805) 685-6374.

One member, Ralph Braunstein, of Los Angeles, CA, reported that "the speed of the screen which results from the patches is very nice indeed", but noted that Mailmerge no longer ran, and certain other print features were no longer available. Bob (who doesn't use Mailmerge) "acknowledges the existence of 'bugs' in his last article and hopes to have them corrected by the next issue. Starplex Microsystems is now being run by Sound-Com of Rochester, 305 Medical Arts, Rochester NY 14607. Contact Marty Lawson, (716) 262-2060. Readers contacting Marty are asked to remind him to return Bob's WordStar manual so that the bugs can be corrected."

► **Error in 32K Classroom**

There is an error in the program listing which appeared in 32K Classroom last issue. Line 350 should read: Kgetkey\1,Key1$\: Goto 250

► **No PC-Works under Cromix**

In last issue's New Products section, it was erroneously stated that PC-Works and MacLine run under Cromix. They don't. Apparently the designers at TouchStone Software Corp. had looked into doing the port but found that it would take considerably more work than originally anticipated — about one week's worth programmer time. Perhaps, if the demand among Cromix users is great enough, someone will perceive a market, and see to it that the port is done. Contact I/O News if interested.

► **SUDS Clarification**

Some questions had been raised regarding Cromemco's SUDS policy in the event that a SUDS subscription is paid for and no software updates for the package are issued during the subscription term — would the SUDS subscription be extended to the next year? The question was left open in the last issue, but was in fact closed.

The SUDS service should be viewed as a type of insurance, with a yearly premium of US $95. The insurance guarantees you any and all updates released during the term of the policy. If no updated software is released during the year you would still need to renew the subscription for the next year to acquire any updates released then. If you review the Current Software Versions lists that are periodically run in *I/O News*, and compare the number of packages with an 84 or 85 in the CREATED column, it is evident that the majority of the software has received at least one update per year, several in some cases such as Cromix and C-10 software.

Another clarification regarding when a SUDS subscription can be initiated is worth mentioning. The rule states that the SUDS subscription should be started at the time the software is purchased. For example, you would probably not

CS-400 BENCHMARK

TIME IN SECONDS TO EXECUTE BYTE* BENCHMARK

	CROMEMCO CS-400	DEC VAX11/750	ALTOS 986	IBM PC/XT	DEC PDP11/23
BENCHMARK					
PIPE	5.4	4.6	6.0	16.6	23.0
SYSTEM CALL	8.8	7.0	11.0	39.8	36.5
FUNCTION CALL	1.0	1.7	0.4	4.7	3.6
SIEVE	2.7	2.4	3.3	8.2	5.8
DISK WRITE	1.2	3.0	3.5	11.6	22.0
DISK READ	1.4	8.0	7.3	20.7	32.7
SHELL	2.9	3.8	7.0	8.5	20.4
LOOP	9.2	5.1	13.3	32.2	27.4
COMPOSITE SCORE	32.6	35.6	51.8	142.3	171.4
MULTI-TASKING BENCHMARK					
1 PROCESS	3.1	4.3	6.3	10.6	22.3
2 PROCESSES	5.5	5.5	7.3	23.4	37.4
3 PROCESSES	8.1	8.8	9.3	42.8	52.3
4 PROCESSES	10.8	10.3	19.3	74.1	74.8
5 PROCESSES	13.4	13.3	27.2	84.2	91.0
6 PROCESSES	16.2	15.0	36.0	130.7	125.0

**Byte Magazine*, August 1985, pp. 132-137

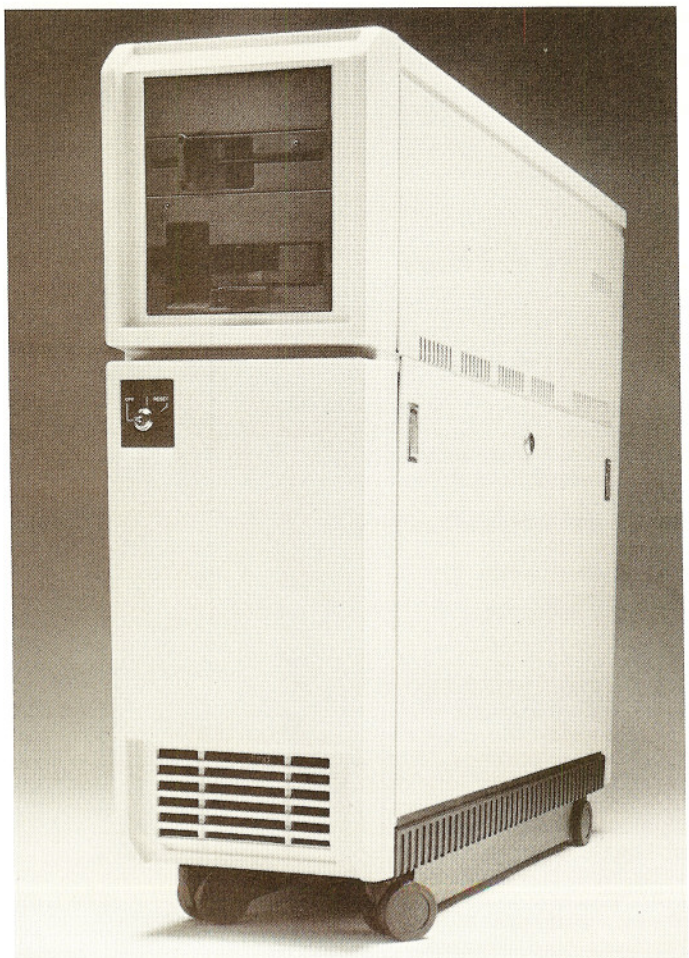


Photo Courtesty of ROCOMP, a Cromemco Distributor in the Netherlands

meet with much success in attempting to update your Z-80 Cromix version 11.05, which you purchased in 1982, to today's version 11.27 for the price of a one year SUDS subscription. If you intend to make use of a software package it is worth the nominal SUDS cost to receive the updates.

This is particulary true with the UNIX System V operating system. Because UNIX is so bulky in terms of the number of floppy disks required to carry it, updates to UNIX will consist of only those programs which have changed or have been added. Installing a new update without having installed prior UNIX updates could cause problems.

MDM-740 RUNNING ON C-10

I.A.C.U. member and C-10 user Robert Deignan writes ... "I would like to comment on the Volume IV, No. 4 bits & bytes, nibbles & tweaks section on BBS software for CDOS. Version 2.56 of CDOS for the C-10 has all of the CP/M 2.2 system calls except Call 31. This call is used to determine the amount of disk space remaining and is not applicable to CDOS."

"I have MDM-740 operating on my C-109 quite well. It requires the user to give the ports and masks required for modem operation. It also requires and assembler and debug to prepare an uninstalled copy of MDM-7xx."

"After having a great deal of difficulty in getting a communication program to work, I appreciate the problems others may have. If you wish you may publish my address an phone number so others may be spared this problem."

Robert T. Deignan
Rt. 4
Canton, Georgia 30114
(404) 345-2151

PASCAL COMPILER FOR CDOS

A Pascal compiler has been developed for use with Cromemco's CDOS operating system by one of our readers in China. The output of the compiler, which is called Pascal-TD, is a Z-80 macroassembly language program which can be used with Cromemco's Z-80 macro assembler. For more information on this compiler, contact:

Liu, Zhong Yi
Vice Dean of the Software Teaching and Research Office
Dept of Computer Science
Tainjin University
Tainjin, China

KERMIT RUNNING UNDER CROMIX

KERMIT is a communications package designed to facilitate file transfer between all types of computer systems. It was developed at Columbia University, and is in the public domain. Columbia makes the software available for a small media cost. The Cromemco Users Group (CUG), in England, have a version of KERMIT that has been adapted to run under Cromix, and are making it available to interested members. For more information contact:

Dr. Peter Norman
University of Newcastle Upon Tyne
Merz Court, Claremont Road
Newcastle Upon Tyne, NE1 7RU
England
Phone: Newcastle 28511, Ext. 3278

328511

MMV EARNS PRESIDENTIAL AWARD

Multi-Media Video, a Cromemco distributor and I.A.C.U. Commercial Member recently received the President's Award for Excellence in Export. MMV, located in Santa Clara, California, has developed an Arabic terminal and software for Cromemco systems and exports these systems to value-added resellers (VARs) in the Middle East. The ARABDATA 50 is a bilingual English/Arabic version of the WYSE 50 terminal. It allows English and Arabic displays on the same line reading from left to right for English and from right to left for Arabic. It also performs "contextual analysis", a process by which the computer determines the proper shape of the Arabic character according to its position in the word. MMV was one of only four companies to be so honored by President Reagan. Congratulations!

CROMEMCO/MEXICO JOINT VENTURE

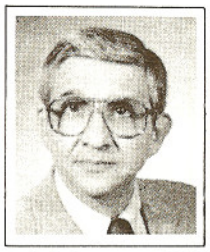
Cromemco, Inc. and Micromex, S.A. of Mexico City, have entered into a join venture named Informatica Cromex, S.A., also of Mexico City. Mexican law requires that foreign companies marketing goods within Mexico must make a direct capital investment within the country. Eventually, Informatica will build and sell all of Cromemco's Unix-based systems in Mexico, supplementing domestic manufacturing. In 1984, Cromemco had an 11.5 percent Mexican market share (compared with IBM's 10 percent), which accounted for some 8 percent of Cromemco's sales.

In light of the recent destruction wrought by the earthquake in Mexico City, we were relieved to learn that the people working at Informatica Cromex were among those fortunate who escaped injury. Although an entire building collapsed nearby, Informatica came through unscathed.

CROMIX-PLUS SUPPORT FOR WDI-II

Good news for Cromix-D users that have not upgraded to Cromix-Plus because they lacked an STDC disk controller. Cromemco plans to release an update to Cromix-Plus, sometime in October, which will support the WDI-II disk controller.

The decision, which runs contrary to Cromemco's desire to produce only the fastest machines, resulted from an overwhelming demand made by Cromix-D users. It's reassuring to know that, despite the technical difficulties involved, Cromemco still maintains a responsiveness to the needs of its' customers. Although the performance of a WDI-II-based system will not be as great as one with an STDC, the inherent performance advantage and expanded capabilities of the 68000 code re-write of Cromix-Plus will be openly welcomed.



32K Classroom

32K Classroom is a regular column aimed at explaining various programming techniques using 32K Structured BASIC. 32K Classroom is edited by Bernie Thomas of Jakes Manufacturing Corp., P.O. Box 23050, Nashville, TN 37202. Users are encouraged to submit examples of their own which may help others in understanding and using this powerful language. Editorial contributions should be sent to 32K Classroom in care of I/O News.

Correction:

In the last 32K Classroom an error was made in the program listing. Line 350 should read: Kgetkey\1,Key1$\ : Goto 250

Conversion of 32K SBasic Programs to 68000 Basic

I recently converted from 32K Structured Basic to the new 68000 Basic, and in doing so, developed some routines to aid in the process.

To begin the conversion, all programs SAVEd in 32K must be LOADed while in 32K and then LISTed to the disk. Then while in 68000 Basic, you must ENTER the programs and then SAVE them back to the disk. Sounds simple enough, right? I have hundreds of programs that had to be handled in this manner.

In addition, certain program changes had to be made in order to run with 68000 Basic. For example, B:, as in the file named B:prchng.sav, had to be changed to /b/prchng.sav. 68000 Basic follows the Cromix directory format instead of the CDOS format. Several other changes were necessary, and they are discussed later.

The first problem became how to quickly and easily LOAD every program while in 32K and then LIST them. Rich Quinn, my Cromemco guru, was in Nashville delivering my new hardware, and we worked out a clever way to accomplish this using a combination of Cromix, screen, and a technique, hitherto unknown to me, which allows Basic to take commands from a file just as it would from the keyboard.

In order to simplify the whole procedure, I converted only one directory at a time, the first of which was /a. This discussion will involve only that directory; but, of course, it was the same for all directories. While in Cromix, I used the "l" command and redirected the output to a file which I called filea.dat.

```
#d /a      (stay in the directory you are converting)
# l > filea.dat
```

It is not necessary to create this file first as Cromix will do it for you.

```
# screen filea.dat
```

At this point you may Delete the names in the file which are not SAVEd programs and therefore not involved, or you can let the Basic program which follows do this for you (as I did). As you can see, every program which is possibly involved is preceded by a space, the numeral 1, and another space. Using the Substitute command, change every occurrence of this to an asterisk. The command is:

```
#s/ 1 //*/
```

(the # signifies that a global substitution throughout the file is to be made).

Now use the 32K routine shown in Listing 1 to complete this command file.

Listing 1.

```
  100   Dim S$(79),S1$(13),S2$(19)
  110   Open\1\"filea.dat"
  120   Create"tempa.dat"
  130   Open\2\"tempa.dat"
  140   Create"fileb.dat"
  150   Open\3\"fileb.dat"
  200 *Get'line : On Error Goto Finish
  205   Input\1\S$ : On Error Stop
  210   P=Pos(S$,".",0) : If P=-1 Then Goto Get'line
  220   P=Pos(S$,"*",0) : E=Len(S$)-1 : S1$=S$(P+1,E)
  230   P1=Pos(S1$,".kat",0) : P2=Pos(S1$,".dat",0)
  235   P3=Pos(S1$,".lis",0) : P4=Pos(S1$,".lib",0)
  240   P5=Pos(S1$,".tem",0) : P6=Pos(S1$,".alt",0)
  245   P7=Pos(S1$,".bak",0) : P8=Pos(S1$,".txt",0)
  250   If P1)-1 Or P2)-1 Or P3)-1 Or P4)-1 Then Goto Get'line
  255   If P5)-1 Or P6)-1 Or P7)-1 Or P8)-1 Then Goto Get'line
  260   @ S1$
  270   S2$="Load"+""""+S1$+""""
  280   @\2\S2$
  290   S2$="List"+""""+S1$+""""
  300   @\2\S2$
  310   S2$="Scr"
  320   @\2\S2$
  325   @\3\S1$
  330   Goto Get'line
  340 *Finish : On Error Stop
  350   S2$="Bye"
  360   @\2\S2$ : Close
  370   Erase"filea.dat"
  380   Rename"tempa.dat","filea.dat"
  390   Stop
 5000 *Lis : List"Conv681"
```

The program does two things. First, it creates a file, filea.dat, containing the necessary commands to LOAD and LIST all of the desired programs. Second, it creates a file, fileb.dat, containing a list of all the program names, which is required by the second program.

In my case, the 32K programs to be converted all have an extension of .sav. And in the directory there are other files, some of which have filename extensions, and some of which don't. Of the ones that do, they will be either .kat, .dat, .lis, .lib, .tem, .alt, .bak, or .txt.

So, in line 200 we read a line from the file we created with "l" and modified with screen. Line 210 determines whether the file name in this line is one of interest. If so, line 220 extracts the file name. Lines 230 thru 255 act as a filter which only allows files ending with .sav to pass.

Lines 270 thru 320 construct the Basic commands to LOAD and then LIST the nominated file (program). The program name is then added to the other file in line 325. This process continues until all lines have been read from filea.dat, at which point the error condition is triggered and the files are closed. The original filea.dat is then erased, and our temp file so renamed.

If you screen or type filea.dat you will see that it indeed duplicates what you would have to do from the keyboard in order to accomplish the task at hand. Now while in /a (or the directory you are converting) and from Cromix type the following command:

```
#  sbasic  <  filea.dat
```

This command calls Structured Basic. But because of the redirection of input, Basic will get its commands from filea.dat rather than from the operator at the keyboard. Your programs are now being LOADed into memory, LISTed to the disk, the memory is scratched and the next program loaded, etc.

The next step is to change the aforementioned coding which is not compatible with 68000 Basic. This is done using the 32K Basic routine shown in Listing 2.

Listing 2.

```
100   Set 0,-1
110   Open\1\"fileb.dat"
120   Dim File1$(17),File2$(13),S1$(199),S2$(199)
200 *Outer'loop : On Error Goto Finish : Input\1\File1$
205   On Error Stop
210   Create"Temp.dat" : Open\3\"Temp.dat"
220   File2$=File1$ : Open\2\File2$
230 *Inner'loop : On Error Goto Loop'end
240   Input\2\S1$
250   On Error Stop
260   X$="A:"
270 *Dir'strt : P=0
280 *Dir'srch : E=Len(S1$)-1 : P=Pos(S1$,X$,P+1)
290   If P)-1 Then  Do
300     S2$=S1$(0,P-1)+"/"+X$(0,0)+"/"+S1$(P+2,E) : S1$=S2$
310     Flag=1 : E'flag=1 : Enddo
320   If E'flag=1 Then E'flag=0 : Goto Dir'srch
330   X$(0,0)=Chr$(Asc(X$(0,0))+1)
335   If X$(0,0)<="H" Then Goto Dir'strt
340   P=0
350 *Dsk'srch
355   E=Len(S1$)-1 : P=Pos(S1$,"Dsk""",P+1)
360   If P)-1 Then  Do
370     S2$=S1$(0,P+3)+"/"+S1$(P+4,E) : S1$=S2$
380     Flag=1 : E'flag=1 : Enddo
390   If E'flag=1 Then E'flag=0 : Goto Dsk'srch
400   @\3\S1$
410   Goto Inner'loop
420 *Loop'end : On Error Stop
425   If Flag=0 Then  Do
430     Close\2\ : Close\3\ : Erase"Temp.dat"
440     @"nothing done to ";File2$ : E'flag=1 : Enddo
450   If E'flag=1 Then E'flag=0 : Goto Outer'loop
460   Flag=0 : S1$=Chr$(26) : @\3\S1$ : Close\2\ : Close\3\
470   Erase File2$
480   Rename"Temp.dat",File2$
490   @ File2$
500   Goto Outer'loop
510 *Finish : On Error Stop : Close : Stop
5000 *Lis : List"Conv682"
```

In addition to converting all occurrences of a semicolon following a directory designation to one preceded by a slash and followed by a slash, the program in Listing 2 has changed the commands Dsk"A", Dsk"B", etc., to Dsk"/a/", etc. While I have not included it in this article, my conversion involved another change necessary to run my 32K programs as 68000 programs. I use the poke and peek commands fairly extensively. Because of the way 68000 memory is allocated in Basic, the address is not constant as in 32K. In order to find the starting address available for a poke, you must use such as Sa = Sys(100). Sys(100) is an additional system parameter not present in 32K Basic: it returns the beginning address of a 256 byte patch space (see page 212 of the 68000 Basic Manual). The variable Sa will thus become the starting address.

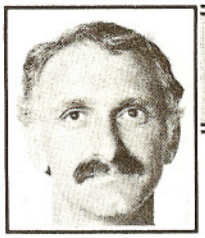
Also, I should mention that KSAM files can be used as they are with no conversion necessary, EXCEPT that KEY LENGTHS of less than four bytes are not acceptable, and will in fact cause much grief if you are not aware of that fact. By the way, I have not encountered the problems with the For and Next loop or the VAL command as noted in the last issue of *I/O News*.

We are now ready for the final step of our conversion. screen filea.dat and Substitute ENTER for LOAD and SAVE for LIST. From Cromix, and in the directory involved, type the following command:

```
# sbasic68 < filea.dat
```

Please note that due to magazine space limitations I have eliminated REMarks in the programs. I would assume, however, that anyone interested in the procedure already has a working knowledge of Basic. If I can be of help to you, please don't hesitate to contact me. Good luck!

Next issue: KSAM Alternate files



Close Encounters of the C-10 Kind

Close Encounters of the C-10 Kind is a regular column directed to users of Cromemco's personal computer, the C-10. It is edited by Dr. Tom Beer, of Applied Environmetrics, located at 118 Gordon St., Balwyn, Victoria 3103, Australia. Dr. Beer can be reached by phone during business hours at (03) 817-2571.

This column is going to be dévoted to communications and printers — or how to get your C-10 talking to another computer or a non-CLQ printer. Before launching into this, a somewhat related topic is the winner of the Great Poll Competition. I am pleased to announce, firstly, that there was a winner and secondly, that he was Mike Bennet of Overland Park, Kansas who works as a Systems Engineer with Motorola. The competition, for those of you with short memories, was: change the SBasic manual listing for the INP command example to one that works (see Close Encounters of the C-10 Kind, *Volume IV, No. 3).*

In his covering letter, Mike Bennett points out that the problem with I/O port polling is that the initialization of either CDOS or SBasic expects the 6551 chip, which is doing all the work, to generate interrupts whenever a character comes in. Interrupts are handled by the operating system so that the incoming character is gobbled up by CDOS long before SBasic ever gets a chance to see it. The solution is to disable interrupts on the 6551. Thus the correct way to get a character from the C-10 console is:

```
 10  Noesc : Integer Character
 20  Rem *** disable irqs at 6551
 30  Out %0032%,%000B%
 40  *Poll
 45  If Binand(Inp(%0031%),%0008%) = 0 Then Goto P oll
 50  Character = Inp(%0030%)
 60  Character = Binand(Character,%007F%)
 70  If Character = %001B% Then Print: Goto Escape
 80  Print Chr$(Character)
 90  If Character = 13 Then Print
100 Goto Poll
110  *Escape : Esc
120  Rem *** reenable interrupts
130  Out %0032%,%0009%
140  End
```

There is insufficient information in the C-10 technical manual to allow one to work out any of this and one needs to obtain the Synertek 6551 data sheets to work out the commands to give the four registers which are listed in Appendix K of the technical manual. The above program tells us that Bit 3 of the status register (31H) signals data availability, whereas the command register (32H) enables and disables interrupts.

The control register controls the Baud rate — the speed at which characters are bobbling to and fro. Now if you connect a modem then it talks to the C-10 through the 6551 Uart (Uart = fancy jargon for the receive/transmit chip and circuitry — Universal Asynchronous Receiver Transmitter). This means that any communication program has to work out the correct and specific Outs to Out to the 6551.

COMMUNICATIONS

It is worth realizing — if you do not already — that the C-10 has superb inbuilt communication facilities. One of the menu options is to connect to a remote system. To do so, all that you need is a modem and, hey presto, the connect program does most of the hard work of setting up the connection. The technically more proficient can achieve the effect via CROS directly. This is a powerful built in feature of the C-10 which I did not appreciate when I purchased my machine. It has its limitations, which we will get to below, but it provides, free, a feature that costs plenty on other personal computers.

All of this came to the fore when my neighbor, who runs a second-hand junk emporium, offered me a fantastic deal on a brand new acoustic coupler. I bought the thing, wired it up as best I could interpret the technical manual wiring guide, plugged it in, phoned a dial up bulletin board and, of course, nothing happened. I cried, swore, tore my hair out and took the thing along to a local electronics guru. He puzzled over it a while and eventually decided its queerness warranted a phone call to the manufacturer. I had tried this with no visible success but he had greater luck and discovered that the acoustic coupler that I had was not an RS232 connection as the box, label and instruction manual all said, but had in fact been altered to connect to a Commodore 64. Luckily, my guru knew his stuff and it only took him five minutes to alter it back to a state from which it would work with the C-10.

There then followed many sleepless but fun-filled evenings which I spent plugging in to various public bulletin boards. I fairly soon discovered that not only were there bulletin boards around, but that there were public access software banks available also. These are known as RCPM (Remote CP/M) Systems. This was most frustrating. You see, the inbuilt connect program turns the C-10 into a dumb terminal. It can receive messages from the other system and it can send messages to the other system, but it cannot access the C-10 disk drive and file away the information. To do this one needs a communications program.

Commercial software packages are available. ProCall and TeleMaster spring to mind. But after hooking in to a number of Australian RCPM systems it became clear that they transfer files using public domain communications programs like MODEM7. Problem. MODEM7 is there, ready and waiting on the other end of the telephone line. However, in order to download MODEM7 I need a communication program like MODEM7, and if I had a communication program that worked I would not need MODEM7. To cut a long story short, I finally got hold of a disk with MODEM7 on it and started on the long, arduous task of getting MODEM7 to work on the C-10. The good news is that I have been successful, and have produced a C-10 version of MODEM7 which is called MODEM10. It is available from Applied Environmetrics on a disk that also contains useful communications utilities such as a file squeezer and its associated unsqueezer. The disk, which forms Volume 2 of the best of public domain software for the C-10, sells for US $25.

PRINTERS

The most fascinating topic of conversation whenever C-10 owners get together is that of printers. This is reflected in the fact that most of the mail I receive from from C-10 users has to do with their printers.

I believe in a quiet trouble-free life. (I also believe in fairies, goblins, and elves but they also elude me). Thus, when I was offered a great price on a CLQ printer, I jumped at the chance. Knowing that the C-10 Writemaster was written with the CLQ printer in mind, I opted for having all Writemaster features functional. The trade-off being the lack of certain characters (such as greater-than, less-than, tilde, back apostrophe, backslash, curly brackets, and vertical bar — which I sorely miss when listing BASIC programs).

I have been half expecting someone to manufacture a graphic daisy wheel which would have the C-10 graphics character set on it. One could then print a screenful of graphics merely by changing daisy wheels. The non-appearance of such a wonderful gizmo leads me to suspect that the number of C-10s actually hooked into CLQ or TP-1 printers is very low. The fact that PRINTER.COM has been removed from the C-10SP Release 5 disk and been replaced by a mode utility that supports nine other well known brands of printers (as well as the CLQ) lends support to my suspicion.

I gather that the implementation of this printer support is not exactly problem free. Letters received from Dr. John Parrish of Emporia State University, Miss K. Bausch, Mr. Craig Nisnewitz, and Mr. Saul Weitz, among others, have been most helpful in sorting out the various problems, and in providing solutions.

With Release 6 of the C-10 software, a change was made in the Writemaster program which renders the technique of using an SBasic program to select a print format, i.e., condensed, correspondence quality, etc., useless (see *I/O News Vol. IV, No. 2*). Writemaster now issues a reset code before printing a document, overriding whatever function was selected by the SBasic program.

Central to the solution is the use of the RAW command, which in effect allows characters to pass thru the printer driver unchanged. The following excerpt from Dr. Parrish's letter explains the technique ...

I used Writemaster to create a dummy file CQP that was loaded with a line of spaces. After CQP was saved in Writemaster, I quit and loaded the program into the debugger, DEBUG. I used the debugger to enter the following hex codes beginning at 0200:

```
0200  A0 A0 A0 A0 A0 A0 A0 A0 A0 1B 7A 02 1B 31 20 1A
0210  1A 1A 1A 1A 1A 1A 1A 1A 1A 1A 1A 1A 1A 1A 1A 1A
```

A similar program, entitled CQP12, was created according to the following scheme:

```
0200  A0 A0 A0 A0 A0 A0 A0 A0 A0 1B 7A 02 1B 31 20 20
0210  1B 4B 20 1A 1A 1A 1A 1A 1A 1A 1A 1A 1A 1A 1A 1A
```

You probably recognize that the hex code 1B 7A 02 represents the RAW command and means that the next two (02) codes after the RAW command (1B 7A) are to be interpreted outside of Cromemco's printer driver for the Okidata. Thus, the command, 1B 31 (ESC-1), is the Okidata printer's hex code for putting it into the correspondence quality print mode (not control-E, which is recognized by Cromemco's new printer driver — see page 138 of the new User Manual).

In the second file, CPQ12, the additional code, 1B 4B, is the code recognized by the printer driver to put the Okidata into the 12 pitch character size print mode (see page 139 of the new C-10 User Manual). The CQP file can then be READ into a blank line at the beginning of any file to cause the printer to go into the correspondence quality print mode at 10 cpi. By inserting the CQP12 file, instead, the printer will print correspondence quality at 12 cpi. Similar files could be created to cause the printer to be put into any of its other print modes, as well ...

In his covering letter, Dr. Parrish suggested that I could reinterpret his patch to a BASIC program and thus make the patch available to a wider audience. To be honest, though I think I know what he is doing I am not quite certain. Thus my suggestion would be to write a program:

```
10  Create "CQP"
20  Open\1\"CQP"
30  Print\1\Chr$(%A0%);Chr$(%A0%);Chr$(%A0%);Chr$(%A0%);
40  Print\1\Chr$(%A0%);Chr$(%A0%);Chr$(%A0%);Chr$(%A0%);
50  Print\1\Chr$(%A0%);Chr$(%1B%);Chr$(%7A%);Chr$(%02%);
60  Print\1\Chr$(%1B%);Chr$(%31%);Chr$(%20%);Chr$(%1A%);
```

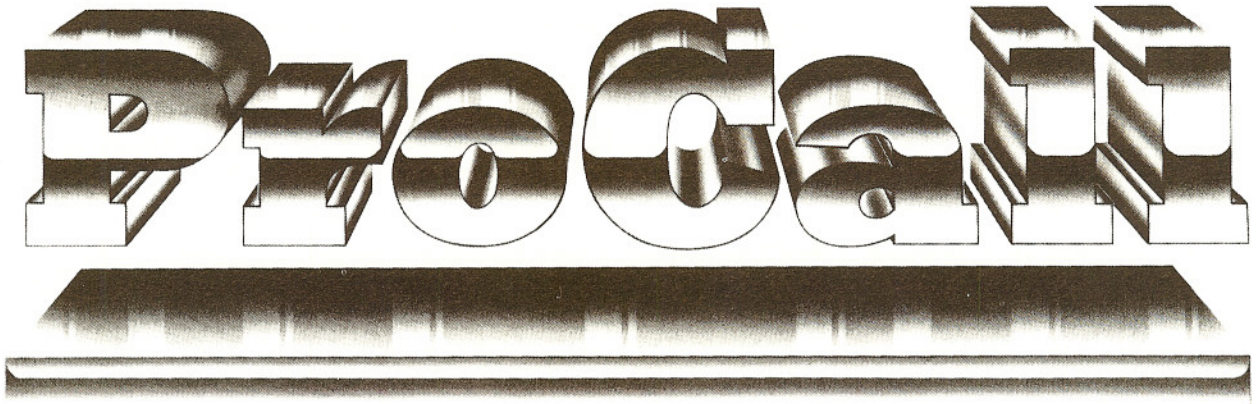
working on the assumption that it is only the first line of the program CQP that is needed. I think the line of spaces was needed merely for DEBUG to have something to work on, and I think the line of 1A are unnecessary padding. If I am wrong in these two suppositions, then extra print statements are needed to produce a line of blanks, and the collection of 1A's. The above example shows you how to produce 1A, and a blank is produced by chr$(%20%).

Saul Weitz indicated both a problem and a solution in his letter. Apparently, the C-10 was printing one line too many on each page, with the result that each succeeding page of print started one line below the start of the previous page.

The solution is to go outside the menu to the CDOS 'A' prompt and type MODE PRT L 65 (Return), changing the default length of the printer to 65 lines per page. Leave the page length in the set format command in Writemaster at 66, as is should be. The result is that the printer will now actually print 66 lines with proper end spaces. This change must be made each time the C-10 is turned on.

Next issue: the Cromemco Resident Operating System (CROS).

CD



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Major Market Area: Sales & Service Worldwide

TRADEWIND SYSTEMS
Box 96, West Highway 54
Liberal, KS 67901
(316) 624-8111, IN KS 1-800-362-9000
Outside KS 1-800-835-2057

Exclusive Cromemco dealer, specializing in complete business systems. Provides consulting services. Full inventory.

Key Personnel: David Fuller, Store Manager
Ray Cole, System Development
Kevin Elmore, System Development
Clark D. Stewart, President
Wayne Stewart, Vice President

Major Market Area: Sales: S.W. Kansas, extending to Colorado, Kansas, Oklahoma, Texas, New Mexico. Service: S.W. Kansas

SYNERGISTICS INTERNATIONAL LTD.
35 Fountain Square Plaza, Suite 207
Elgin, IL 60120
(312) 695-7775

Full inventory of Cromemco hardware and software. Custom software developed in-house. Vertical market packages available include: Chiropractic Clinics; Architectural Woodwork Job Costing; Social Service Agency Accounting; Auctioneering. Specializing in providing turnkey systems to small and medium sized businesses.

Key Personnel: Jim Knowles, Pres. (Sales)

Major Market Area: Sales: Chicago and suburbs, extending to entire U.S. and the U.K. Service: Chicago and suburbs.

Eastern United States

CCS, INC.
A Computer Services Company
733 Third Avenue
New York, NY 10017
(212) 986-7520

Large Cromemco OEM specializing in custom applications on Cromemco Hardware. Full range of services including hardware sales, rentals, long and short term leasing, custom programming and continuous hardware and software support. Specialists in database and large scale financial applications.

Key Personnel: Richard Levey, Vice President
John Ruffo, Vice President

Major Market Area: U.S. and Major cities throughout the world.

TREXIS (Formally Computer Closet Inc.)
45F Route 303
Valley Cottage, NY 10989
(914) 268-5161

Complete systems house providing sales, service and support for the full line of Cromemco hardware and software. Provides system planning and design for custom applications in business, education, and professional fields. Regular schedule of seminars and training classes offered.

Key Personnel: Rick Townsend, President

Major Market Area: Sales: Northeast U.S. and East Coast Service: Continental U.S.

CUSTOM COMPUTER SPECIALISTS, INC.
300 Vanderbilt Motor Parkway
Hauppauge, NY 11788
(516) 231-1155

Full service systems house with retail showroom. Full line of Cromemco hardware, software, accessories, and literature. Provides warranty service, diagnostics, consultation, systems analysis, and custom programming. Special management software for attorneys, mass transportation scheduling, reservations, delivery manifests, education, small business.

Key Personnel: Gregory G. Galdi, President
Linda M. Miller, General Manager

Major Market Area: Sales: Northeast U.S., extending to East Coast.

Service: East Coast extending to Continental U.S.

SYSTEMS ATLANTA, INC.
P.O. Box 99
Highway 5, Toonigh Road
Lebanon, Georgia 30146
(404) 928-0240

As one of Cromemco's oldest dealers, Systems Atlanta is well experienced in hardware and software implementation. With over 1000 systems installed and a full staff of highly seasoned employees, Systems Atlanta offers technical support for operating systems, application software and hardware design. Specific configurations include telecommunications, graphics, data base management as well as fully integrated accounting systems. Systems Atlanta has authored several specific applications packages such as Manufacturing and Inventory Control, Church Management, Job Costing and Unix based programs.

Key Personnel: Charley Dobson, President & G.M.
Betty Dobson, Dir. of Finance & Admin.
Gary Kendrick, Dir. of Marketing
Steve Garrison, Operations Manager

Major Market Area: Worldwide, with exports to South America, Europe, the Middle East and Canada.

Canada

COMPUTER SOLUTIONS
1700 Varsity Estates Drive N.W.
Calgary, Alberta
Canada T3B 2W9
(403) 286-8459 Telex: 03-827506

Complete sales, service and support center for Cromemco and a variety of quality peripherals and support products. Specializing in support over long distances, OEM accounts, custom software, solutions to computing concerns.

Key Personnel: Bob Pyle, General Manager
Mark Dutchuk, Customer Support
John Shepherd, Sales Manager

Primary Marketing Area: Western Canada
Extended Marketing Area: Eastern Canada, Northern/North-Western U.S.

D.E. SYSTEMS LTD.
1284 Wellington St.
Ottawa, Ontario
Canada, K1Y 3A9
(613) 729-5164

D.E. Systems Ltd. is a full service company offering Cromemco Hardware, Software Development, Education and Application Programs. We have developed integrated Inventory, Point-of-Sale, Invoicing, Accounting and Sales Analysis programs as well as a Courier Package. We specialize in Cromemco Computers for government and small businesses. We have most Cromemco products in stock and offer technical support on the hardware and software. We offer maintenance of all Cromemco equipment and related peripherals.

Key Personnel: Bruno Dugas, President
Keith Corkum, Director (Systems Development)
Dwight Presley, Senior Analyst

Major Market Area: Eastern Canada

Mexico

SOPORTE ADMINISTRATIO COMPUTACIONAL, S.A.
15 de Mayo 1111 Pte.
Monterrey, N.L., Mexico
Tels. (83) 43-83-40 and 44-62-69

Complete line of Cromemco hardware and software in inventory. Specializing in Business with Software packages (in CROMEMCO Structured Basic) in Spanish according to Mexican Laws and Taxes including-Accounting, Payroll, Accounts Receivable and Payable, Inventories, etc., provides full service facility, including technical consulting, custom software, warranty and repair.

Key Personnel: Juan Angel Perez, Director
Luis Ernesto Rodriguez G., Marketing
Delfino Juarez, MSEE Technical Support

Major Market Area: Northeast Mexico

International

Europe

Middle East

MICRO COMPUTER SYSTEMS MARKETING CENTER
P.O. Box 1446

Jeddah, Saudi Arabia
(966) (2) 651-7707 or 653-0580/Telex 928-403068 MICSYS SJ

Authorized Dealer in Jeddah-Saudi Arabia (Western Zone) for Cromemco sales and maintenance of computers, peripherals, software development and design. Strong Arabic Software development.

Key Personnel: Abdul Rahman H. Attar, General Manager
Issam Al Safadi, Administrative Manager
M. Ali Khan. Marketing Executive

REALTIME ENGINEERING & DATA ANALYSTS
P.O. Box 278
Dhahran Int'l Airport
Dhahran, Saudi Arabia
(966) (3) 8649043/Telex: 928-670480 READAK SJ

P.O. Box 6156
Jeddah
Saudi Arabia
(966) (2) 6531502

Sales and maintenance of computers, peripherals and supplies within the areas of automation, industrial, business and office. Security systems. Strong in developing ARABIC SYSTEMS (hardware and software) and turnkey projects. Large simulators and facsimile.

Key Personnel: A.A. Salamah, Administrative Director
Nasir Jamil, Manager Digital Systems Div.
Ziyad Ismail, Software Design and Development

Major Market Area: CROMEMCO distributor for Middle East (Saudi Arabia, Gulf Emirates, Iraq, Syria, Jordan, Lebanon)

Far East

ASAHI GLASS
Electronics Group
Special Products Marketing Div.
1-2 Marunouchi, 2 Chome
Chiyodaku, Tokyo 100
Japan
781-24616/Telex: 24616 ASAGLAS

Complete line of Cromemco hardware and software in inventory. 700 sq. foot training room. Specializing in O.S. modifications. Full service facility, providing technical consulting as well as warranty repair service.

Key Personnel: Shigeo Satoh, General Manager (systems)
Norimasa Hori, Manager (sales)
Shinichi Watanabe, Tech/software

Major Market Area: Japan

NCC INTERNATIONAL
Matsunaga Bldg. 1-6-6 Sotokanda Chiyodaku Tokyo 101
Japan 03-(255)7991 / Telex: 781-2523758 KKSHIP J

The oldest microcomputer store of the Byte Inc. Group, offering CROMEMCO to Japan since 1977. This company primarily sells CROMEMCO equipment, and provides high technology and comfortable customer service.

Key Personell: Kiyotake Ikeda
Ryuichi Kawase

SUPER-NATURE COMPUTER CO., LTD.
29 Lane 300, Jen-ai Road, Sec. 4
Taipei, Taiwan. Republic of China.
(02) 705-2442, (02) 700-4858/TELEX: 13937 SNCOMPUT

Our Company primarily sells CROMEMCO computer equipment with high technology and experience, providing installation, warranty repair service and customer education.
Specializing in O.S. modifications, software and hardware development for business and industrial applications.

Key Personnel: Miss Su-Chin Kuo, President
Mr. Mark Yeh, Sales manager
Mr. Morgan Chen, Import/Export department
Mr. Ringol Shiung, Chief of R&D department

Australia

MINICOMP
Minicomp Building
104 Mount St.,
North Sydney, NSW. 2060
Australia
(02) 957-6800
AA75774 MINICO

Key Personnel: Mr. Murray Cleworth, Managing Director
Ms. Kim Ballestrin, National Sales Manager
Ms. Lyn Lyons, Software Development

Minicomp is a major Australian distributor for Cromemco. Services include installation, integration, software support, professional training and software development. We also offer a wide range of peripherals and software compatible with Cromemco systems. We take great pride in providing fast efficient service and support.

INSYSTEMS PTY. LTD.
337 Moray Street
South Melbourne, Victoria 3205
Australia
(03) 690-2899, telex AA30458
84-86 Pacific Highway
St. Leonards, New South Wales 2065
Australia
(02) 439-3788

Australia's largest Cromemco suppliers, with a staff of 18, providing professional services in all areas of computer implementation.

Key Personnel: Dr. Simon Rosenbaum, Managing Director
Norman Rosenbaum, General Manager
Tony Benci, Sales Manager
Ian Holland, Senior Programmer
Sue Stevenson, Sydney Sales

Major Market Area: Australia wide. Dealers in QLD and TAS.

SYSTEMS ATLANTA, INC.

CROMIX SLAVE PROCESSORS

8MHZ Z80H 128K
Two users per slave
FAST — FAST — FAST — FAST — FAST
$1095.00 including software license

MAP100 MICRO ARRAY PROCESSOR

One 4MHZ AMD9511 Processor included
Card supports three processors
Single processor Z80 FORTRAN LIBRARY
Z80 SOURCE CODE NOW INCLUDED
MAKE Z80 FORTRAN 68000 FAST
SPECIAL PRICE — $395.00
Without AMD9511 — $195.00

NEW 32K STRUCTURED BASIC

CROMIX (SBASIC.BIN)	$295
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CP/M	$195
UPDATE CROMIX VERSION	$ 95 *
UPDATE CDOS VERSION	$ 75 *

* Available to registered Cromemco Licensees only.

CP/M for Cromemco S100 Systems **$150**
FAST, interrupt-driven, 58K TPA, CDOS format-compatible
High speed diskette copy utility included

FAST BACKUP for CROMIX Hard Disks **$ 95**
Backup to floppy disk at one megabyte per minute, 8″ or 5.25″

FAST diskette copy programs **$ 95**
Copy both 8″ and 5.25″ CDOS, CROMIX and UNIX formats

Hard disk subsystems include STDC and custom cables.
Choice of attractive cabinet styles including rack mount and CS1

	Single	Dual
25 meg. med speed	$2595	$4195
36 meg. fast	3695	6395
52 meg. faster	4995	8995
85 meg. faster	5995	10995
140 meg. faster	6995	12995

Deduct $995 if STDC and custom cables are not desired.
One year warranty, extended warranty available, fast service.
Overnight replacement of defective drives covered by warranty.

Z80 cartridge tape backup utility **$95**
(Included with purchase of CTD tape subsystem at $1295)

Reliable, 16FDC-compatible 8″ floppy disks replace Persci 299's.

System Three's refurbished by exchange. No need to be down while work is being done.

Large selection of old and used Cromemco and compatible equipment at very low prices. Let us know what you want to buy and make an offer.

CALL OR WRITE FOR INFORMATION ON ALL PRODUCTS AND SERVICES.
SYSTEMS ATLANTA, INC., P.O. BOX 99, LEBANON, GA 30146 (404) 928-0240

CROMEMCO COMPUTERS: DESIGNED TO MAKE UNIX SYSTEM V EVEN BETTER...

UNIX System V, the new standard in multi-user microcomputer operating systems, gives you high performance features along with the portability and flexibility of a standard.

Cromemco computers can make UNIX System V even better. Because our systems are designed with UNIX in mind. First of all, we offer UNIX System V with Berkeley enhancements. Then, our hardware uses advanced features like 64K of on-board cache memory and our high speed STDC controller to speed up disk operations – very important with UNIX.

More capability and expandability

We have a high-speed, 68000-based CPU that runs at 10 MHz, coupled with a memory manager that uses demand-paging and scatter loading to work *with* UNIX, not for it.

We provide room for expanding RAM to 16 megabytes – with error detection and correction – for running even the most sophisticated and advanced microcomputer programs. And the power to accommodate up to 16 users – all with plenty of memory.

But we give you even more.

A complete solution

We give you a choice in systems: the System 100 series, expandable up to 4 megabytes of RAM, and the System 300 series, expandable to 16 megabytes. A high speed 50 megabyte hard disk drive is standard on the systems. And you can expand the hard disk capacity up to 1200 megabytes using standard SMD drives. You can add floating point processing. High resolution graphics. Video digitizing and imaging. Communications through standard protocols. Mainframe interface.

And software support is here to meet your needs. We offer major programming languages, database management systems, communications software, including SNA architecture, X.25 protocol, and Ethernet; even a program to interface to an IBM PC if you need to. And, of course, access to the broad range of standard UNIX applications programs that is growing dramatically every day.

Easy to use.

We also make our systems easier to use, because we install the operating system before we ship your computer. No complicated installation procedures. And the Berkeley enhancements give you the standard UNIX System V operating system, but with the added convenience of these widely acclaimed improvements.

Cromemco's System 100 and System 300 computers: designed to be the highest performance UNIX systems available anywhere.

Just call or visit one of our UNIX System V Official System Centers to see for yourself. They'll also give you a copy of our new publication, "What you should know before you buy a UNIX system." Or contact us directly.

We'll be glad to show you how to get a better UNIX system.

Corporate Headquarters: Cromemco, Inc., 280 Bernardo Avenue, P.O. Box 7400, Mountain View, CA 94039. (415) 969-4710. In Europe: Cromemco GmbH, 6236 Eschborn 1, Frankfurter Str. 33-35, P.O. 5267, Frankfurt Main, Germany.

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